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For related information see also *Astronautics*.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 1786
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 1786
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1786
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 1787
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1789
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1789
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 1790
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1790
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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CONTRACT NUMBER INDEX I-75
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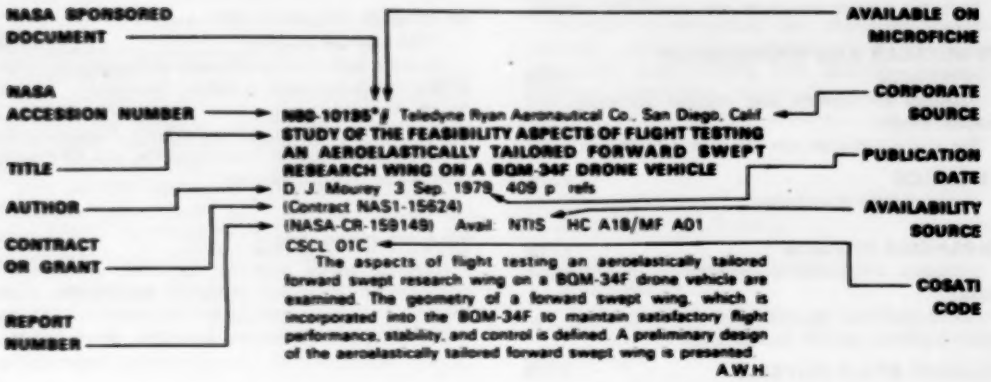
TYPICAL CITATION AND ABSTRACT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TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
PUBLICATION DATE
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D. J. Mourey 3 Sep. 1979 409 p refs
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The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ANALYSIS AND DEVELOPMENT OF GUST ALLEVIATION SYSTEMS FOR SMALL TRANSPORT AIRCRAFT

R.S. Shevell, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NAG 2-18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0002, TRANSONIC AERODYNAMICS

J.D. Cole, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Mechanics & Structures, *405 Hilgard Ave., Los Angeles, California* 90024 (DF055790; F49620-79-C-0162)

AF function - aerospace vehicle design. Opportunity - possibly more economical transonic wing design. Objective - improved analytic techniques for compressible flow problems. How work contributes -numerical parameter optimization is often aided by analytic understanding.

Flow past a finite span wing with Mach number at infinity equal to one has only been addressed to date in a 1953 report from WPAFB by Dr. K.G. Guderley. Guderley's work will be extended to lift and sweepback. A monograph on transonic small disturbance aerodynamics incorporating the many scattered results obtained by Cole and others will be completed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0003, A STUDY OF STREAMWISE VORTICES

R.F. Blackwelder, University of Southern California, School of Engineering, Dept. of Aerospace Engineering, *3551 University Ave., Los Angeles, California* 90007 (NAG 1-19)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0004, PROGRAM OF RESEARCH IN HELICOPTER AERODYNAMIC THEORY

H. Liebowitz, George Washington University, School of Engineering & Applied Sciences, Dept. of Civil Mechanical & Environmental Engineering, *725 23rd St. N.W., Washington, District of Columbia* 20037 (NAG 1-13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0005, STRUCTURAL OPTIMIZATION WITH DAMAGE TOLERANCE CONSTRAINTS

R.T. Haftka, Illinois Inst. of Technology, School of Engineering & Physical Science, Dept. of Aerospace Engineering, *3300 S. Federal St., Chicago, Illinois* 60616 (NAG 1-5)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0006, BOUNDARY LAYER STUDIES OF MODEL AND FULL-SCALE VTOL INLETS IN THE DIFFUSION LIMITED FLOW REGION

M.A. Boles, Indiana Inst. of Technology, School of Engineering, Dept. of Mechanical Engineering, *1600 E. Washington Blvd., Fort Wayne, Indiana* 46803 (NAG 3-4)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0007, THE INTEGRATED MANUAL AND AUTOMATIC CONTROL OF COMPLEX FLIGHT VEHICLES

D.K. Schmidt, Purdue University, School of Aeronautics & Astronautics, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (NAG 4-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Hugh L. Dryden Flight Research Center

1.0008, DYNAMIC DISTORTION ANALYSIS TECHNOLOGY STUDY

W.G. Schweikhard, University of Kansas, Lawrence Campus, Graduate School, *214 Strong Hall, Lawrence, Kansas* 66044 (NAG 3-11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0009, INVESTIGATION OF THE EFFECTS ON THE NEAR WALL TURBULENT BOUNDARY LAYER STRUCTURE BY DRAG REDUCING FLAT PLATE SURFACE GEOMETRY CHANGES

J.M. Wallace, University of Maryland, College Park Campus, School of Engineering, Dept. of Mechanical Engineering, *College Park, Maryland* 20742 (NAG 1-24)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0010, RESEARCH APPLIED TO TRANSONIC COMPRESSORS IN NUMERICAL FLUID MECHANICS OF INVISCID FLOW AND VISCOUS FLOW

W.T. Thompson, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 3-9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0011, A SUBSURFACE PANEL METHOD

J.P. Moran, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Aerospace Engineering & Me-

chanics, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (NAG 2-4)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0012, INVESTIGATION OF FLIGHT TEST METHODS FOR THE PERFORMANCE OF GENERAL AVIATION AIRCRAFT

G. Bull, Mississippi State University, School of Engineering, Dept. of Aerophysics & Aerospace Engineering, *Suite 101 Engineering Bldg., Mississippi State, Mississippi* 39762 (NAG 1-3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0013, AERODYNAMIC CONTROL IN STALLED FLIGHT

L.W. Gross, McDonnell Douglas Astronautics Co., *E. 411 St., St. Louis, Missouri* 63166 (DF143540; F33615-79-C-3606)

This effort supports the Air Force function concerned with maneuver effectiveness, safety, and cost-effectiveness of combat aircraft. The problem is that the flying qualities of many modern combat aircraft degenerate to critical levels when the vehicle enters the stalled flight regime. This significantly reduces aircraft tracking capability, impairs maneuverability, and at times can lead to departure from controlled flight. The lack of reliable prediction methods for stall aerodynamics occasionally has resulted in insufficient attention being given to the stall aerodynamics during the design of the aircraft. Consequently, the subsequent discovery of stall/spin deficiencies following service initiation has penalized some operational aircraft by requiring flight restrictions which impair combat effectiveness without necessarily eliminating the occurrences of inadvertent departure. The problem is often rectified or perhaps only alleviated by extensive (and sometimes expensive) cut-and-try experimentation followed, in some cases, by expensive in-service modifications. The program objective is the achievement of reliable analytical prediction methods for the aerodynamic stability and control characteristics of combat aircraft in stalled flight. The methods are to be used for improving combat aircraft predeparture behavior, softening departure, and preventing excursions into developed spins. The military relevancy involves improved aircraft combat effectiveness, increased safety, and lower costs in terms of reduced aircraft losses.

The approach will employ mathematical modeling of the aircraft airflow, with solutions obtained by means of a digital computer. Initial efforts will be concerned with wings alone with subsequent studies treating increasingly more complicated configurations. Comparisons will be made with available experiments and the additional experiments needed will be identified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0014, AERODYNAMIC-STRUCTURAL STUDY OF CANARD WING, DUAL WING, AND CONVENTIONAL WING SYSTEM FOR GENERAL AVIATION APPLICATIONS

B.P. Selberg, University of Missouri, Rolla Campus, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *Rolla, Missouri* 65401 (NAG 1-26)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0015, COUPLING OF TRANSPORT AND CHEMICAL PROCESSES IN CATALYTIC COMBUSTION

F.V. Bracco, Princeton University, School of Engineering & Applied Sciences, Dept. of Aerospace & Mechanical Sciences, *Box 430, Princeton, New Jersey* 08540 (NAG 3-8)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0016, ANALYSIS OF ROTATIONAL, TRANSONIC FLOWS IN TURBOMACHINERY

D.A. Caughey, Cornell University, Ithaca Campus, Sibley School of Aerospace & Mechanical Engineering, *Ithaca, New York* 14850 (NAG 3-19)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0017, INTEGRAL COMPOSITE SKIN AND SPAR DESIGN STUDIES

H.H. Forsch, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DF141750; F33615-78-C-3209)

Advanced composite structures are beginning to be used in production military aircraft airframes since they offer a large potential for weight and cost savings. The amount of payoff realized by the use of composites will depend upon the efficiency of the design concepts used. A new concept dealing with integral composite skin and spars has a good potential for increasing the efficiency of composite wing structures. Therefore, the objective of this program is to obtain extensive design information on various integral skin and spar concepts so that these designs may be incorporated into future aircraft.

This effort will develop design data for several integral composite skin and spar concepts. An existing fighter aircraft will be used as a baseline, and new concepts will be developed to meet the specific requirements of this baseline. Activities to be conducted include preliminary design, detailed design and analysis, test specimen construction and extensive environmental testing under several loading conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, EXPERIMENTAL FLIGHT TEST EVALUATION OF J79 B/AL BLADES

R.J. Stabrylla, General Electric Co., *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF459270; F33657-76-C-0608)

The objective of this effort is to develop and structurally qualify boron/aluminum J-79 first stage blades for engine qualification testing and evaluate their durability response during subsequent experimental flight test exposure in an RF4/J79-15 turbine engine.

The approach consists of seven tasks. The first two tasks are to develop B/Al blades having improved bond quality and reproducibility suitable for structural, engine qualification and flight testing. The succeeding three tasks include design analysis and bench and structural FOD tests requisite for proceeding to engine qualification testing. The sixth task consists of the procurement of flight test replacement blades. The seventh task includes component build-up, engine installation, delivery to WPAFB for endurance testing and evaluation of flight test evaluation blades.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0019, SPLINE COLLOCATION FOR VISCOUS FLOW OVER AFTER-BODY CONFIGURATIONS

S.S. Rubin, University of Cincinnati, Graduate School, *305 Physics Bldg., Cincinnati, Ohio* 45221 (NAG 1-8)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0020, OPERATION OF A VISITOR, TOUR, AND AN AERONAUTICAL RESEARCH INFORMATION AND COMMUNICATION PROGRAM

K.E. Wiggins, Oklahoma State University, School of Education, Dept. of Curriculum & Instruction, *101 Gunderson Hall, Stillwater, Oklahoma* 74075 (NAS 2-10467)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0021, POLLUTANT FORMATION IN MONODISPERSE FUEL SPRAY COMBUSTION
N.P. Cernansky, Drexel University, School of Engineering, Dept. of Mechanical Engineering & Mechanics, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NAG 3-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0022, FREE-FIELD PROPAGATION OF HIGH INTENSITY NOISE
O.H. Daniel, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NAG 1-4)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0023, A COORDINATE MAPPING PROCEDURE FOR THE COMPUTATION OF VARIABLE DUCT ACOUSTICS
J.W. White, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NAG 3-18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0024, ANALYTICAL STUDY OF JET SHIELDING
C.H. Gerhold, Texas A & M University, College Station Campus, School of Engineering, Dept. of Mechanical Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (NAG 1-11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0025, FINITE ELEMENTS AND NAVIER-STOKES PROBLEMS
G.F. Carey, University of Texas, Austin Campus, School of Engineering, Dept. of Civil Engineering, *200 W. 21st, Austin, Texas* 78712 (NAG 2-5)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0026, METHODS TO ESTIMATE INLET MOMENTUM EFFECTS OF V/STOL
T.D. Beatty, Vought Corp., *P.O. Box 5907, Dallas, Texas* 75222 (DN081101; N62269-78-C-0036)

To provide V/STOL manual type design charts for estimates of inlet RAM drag moment arm, and to determine conditions for inlet separation. This contract supports work unit ZA601, Agency Accession No. DN681080.

An inlet momentum effects computational program will be used parametrically to develop generalized RAM drag charts and charts to identify conditions for flow separation.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0027, CONVERSION OF FLIGHT RECORDS
Unknown, Hampton Inst., Graduate School, *Hampton, Virginia* 23368 (NAS 1-16005)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0028, SCRAMJET INLET ANALYSIS
S.N. Tiwari, Old Dominion University, School of Engineering, Dept. of Engineering, *5201 Hampton Blvd., Norfolk, Virginia* 23508 (NAS 1-15930)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0029, EDGE FUNCTION ANALYSIS
P.M. Quinlan, National University of Ireland, University College at Cork, *Cork, Ireland* (DF289830; AFOSR-79-0075)

AF function - structural design/analysis of aerospace vehicles. Deficiency - present inability to mathematically represent large structural sections in an efficient, inexpensive fashion. Present analysis methods are applied primarily to structural details and areas of high stress concentration. How research contributes - it will improve the accuracy and lower the cost of structural analyses for aerospace vehicles.

Professor Quinlan is developing the edge function method for structural analysis methods applicable to aircraft wing structures and star-shaped propellant grains. In addition to his own research, he has access to data from other agencies and institutions on the application of EFM to specific areas such as vibration, thick plate and fracture problems. His recent advances in 3-D stress analysis will be extended to include ellipsoidal shaped cavities in prismoidal bodies. He will also apply the EFM to vibrations in isotropic, orthotropic and geolotropic plates. He will visit USAF installations to conduct seminars and provide consultative guidance to structural design scientists.

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, NEXT GENERATION COMMUNICATION SATELLITES - MULTIPLE ACCESS AND NETWORK STUDIES
T.E. Stern, Columbia University, School of Engineering & Applied Science, Dept. of Electrical Engineering & Computer Science, *Broadway & W. 116th St., New York, New York* 10027 (NAS 5-25759)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, SYNTHESIS OF PHOSPHATRIAZINES FOR POTENTIAL HIGH TEMPERATURE FLUIDS AND ELASTOMERS APPLICATION
K.L. Paciorek, Ultrasystems Inc., *2400 Michel Dr., Irvine, California* 92715 (DF054240; F49620-79-C-0037)

AF function - future Air Force flight operations require better environment-resistant materials. Deficiency - a need exists for fluids, lubricants and elastomers with better high temperature stability than presently existing materials. Objective - the objective of this research is to synthesize and characterize new polyfluorinated compounds with high thermal and oxidative stability and corrosion inhibiting properties. How work contributes - the work will determine the usefulness of the newly synthesized materials in high temperature applications.

The proposed research investigation is concerned with extension of previously developed phospha-s-triazine and related chemistry to the syntheses of polymers. The following polymeric systems will be considered: a) high molecular weight polyperfluoroalkylether chains terminated by monophospha and diphospha-s-triazines, b) monophospha-s-triazine rings joined by perfluoroalkyl and/or perfluoroalkylether chains, c) eight-membered rings joined by perfluoroalkylether chains. In addition, the applications of the above techniques to bromine-containing perfluorinated materials to obtain polymers with built-in cross-linking sites is contemplated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0002, ION IMPLANTATION TO INHIBIT THE CORROSION OF FERROUS METALS
P.J. Wilbur, Colorado State University, School of Engineering, Dept. of Mechanical Engineering, *Fort Collins, Colorado* 80523 (NAG 3-25)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0003, FATIGUE OF TITANIUM ALLOYS
A.J. McEvily, University of Connecticut, Storrs Campus, School of Engineering, Dept. of Metallurgy, *Box U-37, Storrs, Connecticut* 06268 (DF053740; F49620-79-C-0004)

AF function - resistance to damage due to fatigue processes is necessary to achieve the desired durability of airframe and engine structures. Opportunity - the AFML-MOU with the French has provided a unique condition to study the fatigue behavior of titanium alloys. Objective - to establish the principal mechanisms of fatigue damage in titanium alloys and the influence of processing variables on this damage. How work contributes - results will directly aid in the development of structural materials for future AF applications.

Two titanium alloys (Ti-5524S and Ti-685) will be experimentally examined under elevated temperature fatigue conditions. Characterizations of fatigue damage will be accomplished according to alloys, processing variables and fatigue environment parameters. Experiments will be conducted at room temperature and 540 degrees C and at 0.3 and 0.04 Hz. Failure surfaces will be examined by microscopy techniques to correlate micro/macro observations. In addition, the effects of overload on the fatigue resistance will be studied in terms of work retardation and the above-mentioned characterization parameters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0004, EFFECT OF LOAD INTRODUCTION ON GRAPHITE EPOXY COMPRESSION SPECIMENS
R. Reiss, Howard University, School of Engineering, Dept. of Mechanical Engineering, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NAG 1-23)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

3.0005, THEORETICAL STUDIES OF THE DYNAMICS OF MOLECULAR PROCESSES AND THE ELECTRONIC STRUCTURE OF MOLECULES
M. Karplus, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Chemistry, *Cambridge Station, Cambridge, Massachusetts* 02138 (CHE76-17569 A02)

Dr. Karplus plans to continue the research program initiated under NSF Grant, GP-36104X. The research program deals with applications of theoretical methods to chemical problems. Classical and semi-classical techniques will be employed for the study of dynamical processes in isolated molecules and in molecules surrounded by a solvent medium. Initial studies will include cyclopropane isomerization and molecular dynamics studies of peptides in solution. In addition, semi-classical studies of excited state processes will focus on: (1) transitions from the excited to the ground states when symmetry restrictions yield zero dipole matrix elements; (2) photoisomerization and related conformational changes in conjugated systems; and (3) analysis of the resonance Raman spectra of retinal isomers. Ab initio and semi-empirical studies of the electronic structure of molecules will be continued. Many-body theory will be tested with model potentials and the X method will be used to study metal porphyrins.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0006, CALCIUM INORGANIC ELECTROLYTE BATTERIES
B. Higgins, Eagle Picher Industries Inc., *Joplin, Missouri* 64801 (DF461010; F33615-77-C-2020)

To explore the performance, safety, storage and life cycle cost potential of calcium-thionyl chloride and calcium-sulfuryl chloride batteries as a safer battery than lithium inorganic battery. Applications of interest include power for life support equipment, spacecraft, and missile standby/emergency ground equipment.

The project consists of two phases: (1) Development of cells and establishing basic data on both type batteries against a multitude of load possibilities. Select best potential approach, either thionyl chloride or sulfuryl chloride for follow-on work in second phase. (2) Further investigation mechanisms of selected approach and solution of problems on major deficiencies impeding safety and reliability. Additional investigations toward increased performance and demonstration in full-scale experimental hardware.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

3.0007, THEORETICAL MODELS FOR LOW-DIMENSIONAL EXCHANGE-COUPLED INORGANIC AND ORGANIC CRYSTALS
Z.G. Soos, Princeton University, Graduate School, Dept. of Chemistry, *205 Nassau Hall, Princeton, New Jersey* 08540 (CHE77-27418)

Research previously supported by CHE7607377.

Theoretical research on low-dimensional organic and inorganic crystals will be carried out. In order to understand these important systems, the current theories will be extended to the regime where exchange and thermal energies are comparable, in order to gain more than qualitative information from magnetic resonance experiments. This theory will be tested on a number of compounds which consist of chains (or layers) of transition metal complexes or of stacks of organic radicals. Among the effects to be investigated are the theory of triplet exciton transitions, variable ionicity and related problems in excitation dynamics.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0008, CREEP-FATIGUE INTERACTIONS IN NICKEL-BASED SUPERALLOYS
D.J. Duquette, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Metallurgical Engineering, *110 8th St., Troy, New York* 12181 (NAG 3-22)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0009, ELASTIC ANALYSIS OF A REALISTIC THREE-DIMENSIONAL CRACK CONFIGURATION
G. Sinclair, Carnegie Mellon University, Graduate School, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (DF054710; AFOSR-79-0078)

AF function - to improve fracture tolerant design capability, damage tolerance assessment methodology and residual life prediction for advanced aerospace vehicle and propulsion systems. Deficiency - present inability to predict fracture and crack growth in the many cases where 3-D effects are important. Objective - to understand the interaction between flaw configuration and distribution, structural member geometry, and applied loads for generic 3-D cases. How work contributes - this research provides an alternative approach and technical redundancy to the continuing Air Force research effort to develop realistic (and experimentally verified) crack growth and fracture analysis capability.

To apply two complementary methods - integral equations and advanced finite elements, in tandem, to the recalcitrant problem of determining the characteristic mechanical (stress, strain, displacement) fields in the vicinity of a 3-D crack in an elastic solid. This work will determine the crack front configuration as part of the problem solution rather than a priori specify this configuration, and will give particular attention to the

surface-crack intersection area. The research team combines the skills of outstanding mechanicians and applied mathematicians.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0010, QUANTUM THEORY OF ENERGY TRANSFER IN CHEMICAL REACTIONS
R.E. Wyatt, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Chemistry, *200 W. 21st St., Austin, Texas* 78712 (CHE78-08703)

Dr. Wyatt intends to carry out a quantum mechanical study of three-dimensional atom-diatomic molecule collision processes. Accurate and model studies of energy transfer are planned for both electronically adiabatic and electronically nonadiabatic collisions. Extensive close-coupling studies of vibration-rotation energy transfer are planned for the electronically adiabatic F plus H2 reaction. Distorted-wave and Franck Condon overlap models of resonance structure in chemical reactions will be investigated. For electronically nonadiabatic collisions detailed analysis of the structure and symmetry of electronic-rotational energy correlation diagrams will be carried out as a first step. Then, close-coupling studies of electronic nuclear energy transfer in reactive F(2P) plus H2 and nonreactive C ion (2P) plus H2 collisions will be made. Distorted-wave and overlap models will be extended to specific problems in the theory of electronic-nuclear energy transfer. These new results will provide a much more detailed understanding of how energy is transferred in chemical reactions.

This research represents a continuation of that currently supported by Foundation Grant CHE-7600186.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0011, WELD MICROSTRUCTURE, STRESS STATE AND THE EFFECT OF HYDROGEN ON FATIGUE CRACK INITIATION IN X-65 STEEL
M.R. Louthan, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Materials Engineering, *Blacksburg, Virginia* 24061 (NAG 2-3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, DETERMINATION OF SEM PARAMETERS OF A THIN CYLINDRICAL SCATTERER PARALLEL TO A LOSSY GROUND USING A REFLECTION COEFFICIENT APPROACH
T.H. Shumpert, Auburn University, School of Engineering, Dept. of Electrical Engineering, *Auburn, Alabama* 36830 (DF054130; AFOSR-79-0017)

AF function - this proposed research falls in the 6.1 research objectives which deal with nuclear weapons effects. In particular, cylindrical models near ground planes are used to simulate aircraft near a ground plane in an emp environment. Deficiency - the interaction of the emp with cylindrical scatterers over lossy grounds needs to be analyzed in sufficient depth to determine how well this system can be used to approximate real systems. Objective - the objective of this research is to analyze an integral equation which was generated to treat the interaction of an emp with finite cylindrical scatterers over lossy ground planes. Contribution - provide useful models of an aircraft near a lossy ground plane in an emp environment.

A reflection coefficient approximation will be used to quantitatively determine the singularity expansion method (SEM) parameters of a finite length thin cylinder parallel to a lossy ground. These parameters (natural frequencies, natural modes and coupling coefficients) will be investigated and tabulated as a function of the orientation of the incident field, the distance from the scatterer axis to the ground, and the ground parameters conductivity and permittivity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0002, FLUORESCENT PLASMA TRACER AND PERTURBATION EXPERIMENTS FROM SOUNDING ROCKETS
E.M. Wescott, University of Alaska, Fairbanks Campus, School of Arts & Sciences, Dept. of Geophysics, *Fairbanks, Alaska* 99701 (NAG 6-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

4.0003, TRANSIENT RESPONSE OF ROTOR-BEARING SYSTEMS USING COMPONENT MODE SYNTHESIS
H.D. Nelson, Arizona State University, School of Engineering & Applied Sciences, Dept. of Engineering Science, *Tempe, Arizona* 85281 (NAG 3-6)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0004, GEAR LUBRICATION AND COOLING STUDY
L. Akin, California State University & Colleges, California State University, Long Beach Campus, School of Engineering, Dept. of Chemical Engineering, *6101 E. 7th St., Long Beach, California* 90840 (NAG 3-20)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0005, IMPROVED FLOW VISUALIZATION BY USE OF RESONANT REFRACTIVITY
D. Bershader, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (DF054530; AFOSR-79-0058)

AF function - aerospace vehicles. Opportunity - Air Force flight operations depend on the science of aerodynamics for the quantitative prediction of performance and loads on vehicle surfaces, both for operational use and especially for rational design. Optical methods viz shadowgraph, schlieren and interferometry are important and long established tools of experimental aerodynamics. There is a need for obtaining highly increased sensitivity in these refractive optical methods. With the use of laser sources, resonant refractivity should provide this needed highly increased sensitivity in refractive optical systems. Objective - to develop a resonant refractive system for air and to demonstrate its use with a simple flow field. How work contributes -this work will investigate the feasibility of using the resonant refractivity of sodium or other vapor to enhance the sensitivity of optical flow measurements by a factor of 100.

Theoretical and experimental graduate study and post-doctoral research are being done to provide a feasibility assessment and design recommendations for using resonant refractivity of sodium or other vapor to provide flow visualization for very weakly refractive flows.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0006, HEAT TRANSFER AND HYDRODYNAMIC STUDIES ON A CURVED SURFACE WITH FULL-COVERAGE FILM COOLINGS
J.P. Johnston, Stanford University, School of Engineering, Dept. of Mechanical Engineering, *Stanford, California* 94305 (NAG 3-3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0007, THE DESIGN METHODOLOGY OF DISTRIBUTED PROCESSING SYSTEMS
C.V. Ramamoorthy, University of California, Berkeley Campus, School of Engineering, Dept. of Electrical Engineering & Com-

puter Sciences, *Berkeley, California* 94720 (DF055960; F49620-79-C-0173)

AF function - data processing for avionics. Deficiency - software engineering tools for distributed data processing are inadequate for efficient exploitation of inexpensive hardware. Objective - develop software engineering tools for distributed processing systems. How work contributes - successful completion of this research will establish basis of design theory for distributed computer systems.

The research will develop design methodology to establish a basis for design theory for the development of distributed processing systems. The design methodology will provide guidelines and design laws for the systematic design and construction of distributed processing systems such that the users' requirements are satisfied. The philosophy behind the approach is multi-functional, multi-level modeling of a distributed processing system. The research will develop models and techniques for the formal specification, decomposition, testing and validation of a distributed system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0008, INVESTIGATIONS RELATIVE TO STATISTICAL PROCEDURES FOR THERMAL VACUUM TEST OPTIMIZATION

R.E. Williams, Fort Lewis College, Undergraduate School, Dept. of Mathematics, *Durango, Colorado* 81301 (NAG 5-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0009, INVESTIGATION OF DISTRIBUTED MICROCOMPUTER METHODS FOR HIGH AUTHORITY AUTO FLIGHT SYSTEMS

W.R. Dunn, University of Southern Colorado, Graduate School, *2200 Bonforte Blvd., Pueblo, Colorado* 81001 (NAG 2-2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0010, MICROWAVE CIRCUIT DESIGN

R. Chowdhury, Howard University, School of Engineering, Dept. of Electrical Engineering, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NAS 5-26019)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0011, RESEARCH ON ASPECTS OF THE MASSIVELY PARALLEL PROCESSOR

A.P. Reeves, Purdue University, School of Electrical Engineering, *Executive Bldg., West Lafayette, Indiana* 47907 (NAG 5-3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0012, LASER RANGING AND RADIO INTERFEROMETRIC DATA FOR DETERMINATION OF GEOPHYSICAL PARAMETERS

Unknown, Massachusetts Inst. of Technology, Graduate School, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAS 5-25833)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

4.0013, HYBRID OPERATOR MODELS FOR DIGITALLY IMPLEMENTED CONTROL SYSTEMS

G. Stein, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering & Computer Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 1-2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0014, APPLICATION OF PULSE CODE MODULATION (PCM) TECHNOLOGY TO AIRCRAFT DYNAMICS DATA ACQUISITION

C.A. Detmer, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF143050; F33615-79-C-3205)

The Air Force function for this effort is to study pulse code modulation (PCM) technology for future data acquisition. PCM offers the advantages of increased data accuracy and reduced test costs. The problem is that processing of data from a PCM data acquisition system could become so massive that the projected advantages would be reduced or eliminated. The goal is to design a data acquisition and analysis system and to identify rationale for the creation of that design. This work will improve the capability of the Flight Dynamics Laboratory to support Air Force systems.

The contractor will provide the design of a data acquisition and analysis system that uses PCM technology and a report of the rationale, considerations and judgments involved in the creation of that design. The contractor will consider using all, part or none of the present equipment. It will compare cost versus capabilities of different configurations. It will weigh advantages of in-the-air preprocessing versus additional time for ground processing.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0015, STUDIES OF IMAGE ANALYSIS

W.E. Snyder, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Electrical Engineering, *Raleigh, North Carolina* 27607 (NAG 1-20)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0016, IMPROVED AND EFFICIENT LASER ANEMOMETERS

R.V. Edwards, Case Western Reserve University, School of Engineering, Dept. of Chemical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAG 3-2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0017, STUDY AND REVIEW OF PERMANENT MAGNETS FOR ELECTRIC VEHICLE PROPULSION MOTORS

Unknown, University of Dayton, Graduate School, *300 College Park Ave., Dayton, Ohio* 45469 (DEN 3-189)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

4.0018, A HIGH TEMPERATURE SILICON-ON-SAPPHIRE PRESSURE SENSOR

S.K. Kahng, University of Oklahoma, Norman Campus, School of Engineering, Dept. of Electrical Engineering, *660 Parrington Oval, Room 101, Norman, Oklahoma* 73069 (NAG 1-14)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0019, ELECTRO-OPTICAL SYSTEM CONTROLLER AND PROCESSOR

D. Casasent, Carnegie Mellon University, School of Engineering, Dept. of Electrical Engineering, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (NAG 3-5)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0020, FORMULATE A MULTI-DIMENSIONAL, UNSTEADY, TURBULENT, COMPRESSIBLE, REACTING FLOW CODE FOR OTTO CYCLE CODES AND ENGINES
W.A. Sirignano, Carnegie Mellon University, School of Engineering, Dept. of Mechanical Engineering, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (NAG 3-21)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0021, APPLICATION OF VARIABLE STRUCTURE SYSTEM THEORY TO AIRCRAFT FLIGHT CONTROL
A.J. Calise, Drexel University, School of Engineering, Dept. of Mechanical Engineering & Mechanics, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NAG 2-8)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0022, A NUMERICAL ALGORITHM FOR NONLINEAR FEEDBACK AND NONLINEAR CASCADE COMPENSATION
R.L. Carroll, University of South Carolina, School of Engineering, Dept. of Engineering, *Admin. Bldg., Room 115, Columbia, South Carolina* 29208 (DF054460; AFOSR-79-0001)

AF function - design missile control systems. Deficiency - the performance of an air-to-air missile in a simple-missile-target encounter is degraded with the lack of thrust magnitude control. Objective - the objective of this proposal is to design a novel algorithm which will produce the system control in the form of both a nonlinear state feedback plus a nonlinear cascade compensator. How work contributes - results in this study will aid in the design of thrust controllable missile systems.

An algorithm will be developed which is capable of generating both a nonlinear feedback control and a nonlinear open-loop control. The algorithm will be tested using a nonlinear model for the target-seeking problem. A comparison of the nonlinear controller for the target-seeking model will be made with a controller designed by linear-quadratic means.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0023, LIGHTNING SENSORS AND DATA INTERPRETATION
T.F. Trost, Texas Tech University, School of Engineering, Dept. of Electrical Engineering, *P.O. Box 4340, Lubbock, Texas* 79409 (NAG 1-28)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0024, SOLID EARTH DYNAMICS USING LASER GEODYNAMICS SATELLITE RANGE OBSERVATIONS
B.D. Tapley, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712 (NAS 5-25991)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0025, RESEARCH IN THE AREA OF PHYSICAL SCIENCES
Unknown, College of William & Mary, Williamsburg College, Graduate School, *Ewell Hall, Williamsburg, Virginia* 23185 (NAS 1-16042)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0026, THE REDUCED ORDER MODEL PROBLEM IN DISTRIBUTED PARAMETER SYSTEMS ADAPTIVE IDENTIFICATION AND CONTROL
C.R. Johnson, Virginia Polytechnic Inst. & State University, Graduate School, *Blacksburg, Virginia* 24061 (NAG 1-7)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0027, RESEARCH ON FLOW PHENOMENA RELATED TO HIGH POWER LASER
W.H. Christiansen, University of Washington, School of Engineering, Dept. of Aeronautics & Astronautics, *206 Guggenheim Hall, Seattle, Washington* 98105 (DF053980; F49620-79-C-0020)

AF function - high energy lasers. Opportunity - improve our understanding of the flow phenomena associated with modern high-power continuous wave gas lasers. Objective - develop new fundamental concepts for the interaction of laser radiation with flow and search out new approaches to improve performance. How work contributes - detailed quantitative understanding of fluid flow-laser radiation interaction will allow design trade-offs which optimize high power gas lasers performance.

A combined analytical and experimental program is being conducted. The proposed work will include the study of the interaction of the aerodynamics and discharge phenomena in flow lasers, the study of fluid optics involving the use of flow as an optical control element, a study concerned with the phenomena involving shear layers in nonequilibrium and reacting gases in a lasing cavity, and a study on pressure recovery systems applicable to lasers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0028, IN-SERVICE SHAPING OF ABRADABLE SEALS
J. Wolak, University of Washington, School of Engineering, Dept. of Mechanical Engineering, *206 Guggenheim Hall, Seattle, Washington* 98105 (NAG 3-7)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0029, VHF-UHF DEEP FADING
A. Bushby, Instituto Geofisico del Peru, *Lima, Peru* (DF245970; AFOSR-76-2885)

AF function - communications, radar. Deficiency - signal fading causes high error rates in communications, loss of signatures in radar identifications. Objective - to determine and predict effects of the equatorial ionosphere on signals transmitted by satellites. How research contributes - predicts and maximizes message reliability. This work continues VHF, UHF and l band observations in Peru. The work will be extended to include observations at Negritos, a site displaced from the geomagnetic equator of scintillation and total electron content. Additional support will be given the AFAL/AFGL flight test program of communications satellite operation in the equatorial zone.

VHF and UHF satellite signals will be observed at three locations in Peru, and l band signals at one location. These will be supplemented by radar observations and will support on-board observations using AFAL and AFGL aircraft of the LES 8/9 satellites in order to establish communications characteristic of the equatorial ionosphere. This work continues to support the AFSATCOM II program and the AFGL/AFAL equatorial flight test programs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, DEVELOPMENT OF CAPABILITIES FOR COMPUTER PROCESSING OF REMOTELY SENSED DATA
Unknown, Alabama Agricultural & Mechanical University, Graduate School, *Normal, Alabama* 35762 (NAG 8-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0002, ANALYSIS OF MAGNETIC AND AURORAL DATA FROM THE IMS ALASKA MERIDIAN CHAIN OBSERVATORIES

S.S. Akasofu, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM76-12259)

In a companion grant entitled 'International Magnetospheric Study (IMS) Alaska Meridian and Longitudinal Array of Magnetometers and All-Sky Cameras', the Geophysical Institute of the University of Alaska will install, maintain and operate magnetometers, all-sky cameras and riometers in a chain of 17 observatories.

This grant will support the processing and analysis of a variety of data taken from the Alaskan meridian chain in order to facilitate studies with satellite and other ground-based data. The project will facilitate a cooperative program with the Environmental Data Service (EDS/NOAA), Space Environment Laboratory (SEL/NOAA) and the two Canadian meridian chains by providing processed auroral and magnetic data to the IMS scientific community. As such this grant will permit the goals of IMS to be achieved, i.e., coordinated research on magnetospheric dynamics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0003, S/M AND PERSONNEL FOR THE OPERATION AND MAINTENANCE OF THE POKER FLAT RESEARCH RANGE

N.B. Brown, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (NAS 6-3065)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Wallops Flight Center

5.0004, COMFUTER MODELING OF MOLECULAR SPECTRA FOR AURORAL STUDIES

V. Degen, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM76-80281)

This grant funds a program of auroral studies in which molecular spectra are modeled on a computer for comparisons with observed data. The analytical basis is a set of computer programs for the major N2 and N2 plus molecules. The experimental data are provided by the new Geophysical Institute optical facility located at Poker Flat, Alaska. The system features two fast spectrometers and a photometer, and computer-controlled data handling and display.

The purpose is to examine and quantify excitation processes and source conditions in various types of electron and proton auroras and to provide synthetic spectra for general reference. The proposed work will involve publication of data on hand, update of existing computer decks and coding of new band systems, conversion from IBM 360/40 to a new time-sharing system under Honeywell, and further auroral observations.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0005, A THEORETICAL STUDY OF THE SUBSTORM PROCESSES

J.R. Kan, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM77-11371 A01)

It is generally agreed that the magnetospheric substorm results from an explosive conversion of magnetic energy generated by the interaction between the solar wind and the magnetosphere. The substorm triggering process responsible for the explosive energy conversion is still an open question. It is believed that the substorm triggering process is intimately related to the following fundamental problems in magnetospheric physics: (A) the mechanism for the magnetotail formation, (B) the magnetopause structure and the associated momentum-energy transfer process, and (C) the origin of the auroral current sheet.

This award will support theoretical research into these areas in order to improve our understanding of the magnetospheric substorm.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0006, IONOSPHERIC ACCELERATION MECHANISMS

R.D. Sharp, Lockheed Missiles & Space Co. Inc., Research Laboratory, *1111 Lockheed Way, Sunnyvale, California* 94088 (ATM77-09853 A01)

This grant will support the analysis of selected portions of the data from the energetic ion mass spectrometer experiment on the Air Force satellite 1976-65B. The experiment measures ions in the energy range 0.5 to 16.0 keV and separates the ionic components on the basis of mass per unit charge. The central focus of the investigation will be the understanding of the mechanisms responsible for the energization of ambient ionospheric ions which have been observed flowing upward out of the ionosphere into the magnetosphere with energies in the keV range. One important objective of the research will be the identification of the origin of the trapped particles in the Van Allen radiation belts.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0007, PLASMA-LINE STUDIES WITH THE INCOHERENT-SCATTER RADARS AT ARECIBO

V.B. Wickwar, S R I International, Radio Physics Laboratory, *300 Ravenswood Ave., Menlo Park, California* 94025 (ATM76-21305 A01)

This action funds the first year of a two-year continuing grant for studies of the Earth's ionosphere using the incoherent scatter radar facility at the National Astronomy and Ionosphere Center at Arecibo, Puerto Rico. Research to be done falls into two main parts. The first part centers around the analysis of existing data; the second involves new measurements. Included in the first are studies of plasma lines and photoelectron fluxes at Arecibo, and the analysis of data taken during past ionospheric heating experiments there. The second includes development of new data acquisition software for NAIC, new plasma line observations, and participation in future ionospheric heating experiments.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0008, DESIGN, FABRICATION, ASSEMBLY AND INSTALLATION OF AN INTERNATIONAL SUN-EARTH EXPLORERS-3 DATA BOX

F.S. Mozer, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAS 5-25958)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

5.0009, MECHANISM OF SYNTHESIS OF AMINO, HYDROLY AND DICARBOXLEC ACIDS IN CARBONACIOUS CHONDRITES

S.L. Miller, University of California, San Diego Campus, Graduate School, Dept. of Chemistry, *P.O. Box 109, La Jolla, California* 92037 (NAGW 20)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Office of Space Science

5.0010, INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE
Unknown, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAS 5-25957)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0011, EXPERIMENTAL AND THEORETICAL STUDY OF HETEROMOLECULAR NUCLEATION OF VAPORS OCCURRING IN THE ATMOSPHERE
P.P. Wegener, Yale University, School of Engineering, Dept. of Engineering & Applied Science, *206 Elm, New Haven, Connecticut* 06520 (NAG 2-15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0012, APPLICATION OF REMOTE SENSING TO THE MANAGEMENT OF DELAWARE'S COASTAL RESOURCES
V. Klemas, University of Delaware, School of Arts & Sciences, Dept. of Geography, *Newark, Delaware* 19711 (NAS 5-25934)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0013, LOGISTICS SUPPORT OF THE U.S. PROGRAM IN ANTARCTICA (LC-130 AIRCRAFT SUPPORT FOR THE GREENLAND ICE SHEET PROGRAM)
C.H. Nordhill, U.S. Dept. of Defense, *1776 Massachusetts Ave. N.W., Washington, District of Columbia* 20301 (DPP7610886A12)

LC-130 aircraft operated by Antarctic Development Squadron Six (VXE-6), the Navy squadron assigned to provide aviation support to the U.S. Antarctic Program, are going to be utilized to provide support to the Greenland Ice Sheet Program (GISP). This support will require between 300 and 400 flight hours.

The squadron is funded by NSF but by Congressional direction funds allocated for the U.S. Antarctic Program cannot be used for other projects. Consequently, this award is to provide the necessary funds from the Arctic Research Program for the aviation support provided by VXE-6 for GISP-78.

The Greenland Ice Sheet is the only continental ice sheet in the northern hemisphere. Several thousand years ago similar ice sheets covered nearly 30 percent of the Earth's surface. It is well known that in the past ice sheets have fluctuated in size. It is widely believed that glacial conditions will recur in the near future. The Greenland Ice Sheet Program is designed to determine the geophysical and geochemical characteristics of the major physiographic, environmental, thermal and dynamic zones of the ice sheet to study the factors controlling present and past mass balances, atmospheric processes and the ice sheet's response to climatic change.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0014, INVESTIGATION OF MICROWAVE RADIOMETER DATA IN GLOBAL NUMERICAL WEATHER PREDICTION
T.N. Krishnamurti, State University System of Florida, Florida State University, School of Arts & Sciences, Dept. of Meteorology, *205 Wildwood Dr., Tallahassee, Florida* 32306 (NAG 5-6)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0015, DEVELOPMENT OF A TECHNIQUE TO ASSESS WETLANDS WASTE ASSIMILATION POTENTIAL INCORPORATING LANDSAT TECHNOLOGY
J.L. Cooley, University of Georgia, Inst. of Ecology, *Athens, Georgia* 30601 (NAS13-137)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0016, CONDUCT SHORT COURSES IN REMOTE SENSING
E.A. Martina, University of Kansas, Lawrence Campus, School of Liberal Arts & Sciences, Dept. of Geography & Meteorology, *112 Bailey Hall, Lawrence, Kansas* 66045 (NAS13-131)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0017, MERIDIAN PHOTOMETER CHAIN
R.H. Eather, Boston College, Chestnut Hill Campus, School of Arts & Sciences, Dept. of Physics, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (ATM77-04286 A01)

This grant funds the fielding, operation, and data analysis of a three-station meridian-scanning photometer chain along the Canadian auroral oval. Scientific objectives of the program include the investigation of subvisual pre-substorm signatures in spectral and spatial characteristics of the aurora, the details of spectral changes during poleward expansion and recovery, the role of protons in the substorm process, the nature of the diffuse aurora, and the integrated conductivity of the auroral region during substorm process. In coordination with satellites such as ISIS-II, TRIAD, and ISEE there is planned an investigation of field-aligned currents, the nature of near-Earth acceleration mechanisms, and their relationship to the latitude-time morphology of precipitation.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0018, REEL DOWN/REEL UP TECHNIQUE FOR STRATOSPHERIC AND TROPOSPHERIC OBSERVATIONS
J.G. Anderson, Harvard University, Cambridge Campus, Graduate School, *Cambridge Station, Cambridge, Massachusetts* 02138 (NAS 6-3061)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

5.0019, RESEARCH IN IMAGE FILTERING AND DATA COMPRESSION
A.V. Oppenheim, Massachusetts Inst. of Technology, School of Engineering, Dept. of Electrical Engineering & Computer Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 5-2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0020, STUDY IN PLANETARY AERONOMY
T.E. Cravens, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Atmospheric & Oceanic Sciences, *Ann Arbor, Michigan* 48104 (NAGW 15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0021, ANALYSIS OF THE THERMAL BALANCE OF THE VENUS IONOSPHERE
A.F. Nagy, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Atmospheric & Oceanic Sciences, *Ann Arbor, Michigan* 48104 (NAS 5-25939)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0022, STIMULATING OPERATIONAL PRIVATE SECTOR USE OF EARTH OBSERVATION SATELLITE INFORMATION
L.F. Eastwood, Washington University, School of Engineering & Applied Science, Dept. of Electrical Engineering, *4559 Scott Ave., St. Louis, Missouri* 63130 (NASW 3331)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space & Terrestrial Applications

5.0023, LASER GEODYNAMICS EXPERIMENT STUDY OF POLAR MOTION, PLATE RIGIDITY AND PLATE MOTIONS
W.J. Morgan, Princeton University, School of Natural Sciences, Geological & Geophysical Sciences, *Box 430, Princeton, New Jersey* 08540 (NAS 5-25896)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0024, SET UP A COMPUTER SYSTEM FOR THE SPACECRAFT PLANETARY IMAGING FACILITY AT CORNELL
J.F. Veverka, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (NASW 3342)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0025, PLANETARY SUBSURFACE WATER ANALYZER INSTRUMENT DEVELOPMENT (PHASE 4 DEVELOPMENT EFFORT)
D.M. Anderson, State University of New York, Albany Campus, School of Science & Mathematics, Dept. of Geological Sciences, *1400 Washington Ave., Albany, New York* 12222 (NASW 3333)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0026, EXPERIMENTS IN THE FORMATION OF AEROSOLS BY PHOTO-OXIDATION OF SULFUR DIOXIDE
J.P. Friend, Drexel University, School of Science, Dept. of Chemistry, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NAG 2-10)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0027, DOCUMENTATION OF LANDSAT ASSESSMENT OF FOREST LAND COVER IN NORTHERN THAILAND
L. Miller, Texas A & M University, College Station Campus, Texas Engineering Experiment Station, *College Station, Texas* 77843 (NAS 5-25941)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0028, SATELLITE RANGING DATA ANALYSIS LAGEOS GEODYNAMICS EXPERIMENT #2
P.J. Shelus, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NAS 5-25898)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0029, EARTH STRAIN MEASUREMENTS WITH TRANSPORTABLE LASER RANGING SYSTEM - FIELD TECHNIQUES AND PLANNING LASER GEODYNAMICS EXPERIMENT #22
H.J. Dorman, University of Texas, Medical Branch at Galveston, Graduate School, *Galveston, Texas* 77550 (NAS 5-25897)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0030, STRATOSPHERIC PROCESSES
D.A. Tripp, Utah Higher Education System, Utah State University, Center for Research in Aeronomy, *Main Bldg., Office 104, Logan, Utah* 84321 (ATM77-01869 A03)

Measurements exist of scattered solar ultraviolet flux as a function of various altitudes, solar zenith angles and viewing directions. These data have several important impacts on the current understanding of the stratosphere. We find that the data are extremely sensitive to the overhead atmospheric content of ozone. Application of a careful scattering model of the data could provide an especially accurate method of measuring the O3 overburden providing adequate cross-section information is available.

This action will fund a careful atmospheric dissociation rate calculation allowing for the dissociation rate due to the direct solar flux, due to the reflected light from the earth, due to first order atmospheric scattering, and due to higher order scattering. The goal of this would be to significantly improve measurement of atmospheric ozone contents. It would also enhance understanding of atmospheric science at Weber State University.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0031, RADIATIVE TRANSFER MODELS FOR THE EARTH RADIATION BUDGET STUDIES
S.N. Tiwari, Old Dominion University, School of Engineering, Dept. of Engineering, *5201 Hampton Blvd., Norfolk, Virginia* 23508 (NAG 1-21)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0032, APPLICATIONS OF LANDSAT IMAGING TO STATE INFORMATION SYSTEMS
R.H. Giles, Virginia Polytechnic Inst. & State University, School of Agricultural & Life Sciences, Dept. of Wildlife & Fisheries Science, *Blacksburg, Virginia* 24061 (NAS 5-25935)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0033, INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA
C.R. Bentley, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Geology & Geophysics, *500 Lincoln Dr., Madison, Wisconsin* 53706 (NAS 5-25977)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, ADVANCED CONCEPTS IN AIRCREW PERFORMANCE MEASUREMENT
D. Vreuls, Canyon Research Group Inc., *32107 Lindero Canyon Rd., Suite 123, Westlake Village, California* 91361 (DF055170; F49620-79-C-0072)

AF function - this research supports Air Force flying training R and D programs. Deficiency - the science of objective aircrew performance measurement is rapidly developing in the Air Force, Army and Navy R and D communities in conjunction

with new training devices, especially operational flight trainers and full mission simulators. At this time this development is roughly in three parallel and separate tracks, one for each service, which do not take advantage of advances made within the community. While some measures will be unique to a specific service's aircraft and mission, other measures will share a commonality between services. At this time, our limited knowledge of performance measurement techniques does not allow rigorous standardization across efforts. Objective - the objective of this research will be to study aircrew performance measurement efforts within the Air Force, Army and Navy R and D communities and to develop a framework for establishing standards of how performance measurements should be made and reported. How research contributes - this research will determine if the three services can have complementary programs in aircrew performance measurement and specify in which areas commonalities can be maximized by establishing standards for measuring and reporting dependent measures in empirical research.

The principal investigator will examine ongoing programs in performance measures development among the three services as well as the current technologies which other R and D communities use to standardize or calibrate their measurements. Several candidate measures will be selected along a range of complexity and procedures for isolating the common elements will be developed. Standards will be attempted for these measures and, if successful, procedures which will permit the work to be expanded to other measures will be developed. This effort will be conducted under the supervision of a tri-service working group of scientists from the training R and D community which will guide the principal investigator in his selection of measures and evaluate the resulting standardization efforts.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0002, THE ANNOYANCE OF IMPULSIVE HELICOPTER NOISE

K. Karamcheti, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NAG 1-17)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

6.0003, MOLTEN CARBONATE CO2 CONCENTRATOR

J. Winnick, Georgia Inst. of Technology, School of Chemical Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAG 2-11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0004, DETECTION OF MOTION UNDER TARGET UNCERTAINTY AND PERIPHERAL PRESENTATION

R.W. Sekuler, Northwestern University, Evanston Campus, School of Arts & Sciences, Dept. of Psychology, *633 Clark St., Evanston, Illinois* 60201 (DF055300; F49620-79-C-0088)

AF function - among the most critical functions subserved by human vision is the perception of human targets. Prompt and accurate detection of targets is an essential requirement for the effectiveness of critical Air Force missions. Deficiency - two factors prevent extrapolation of laboratory studies to field conditions: (1) there is little or no uncertainty concerning characteristics of targets to be detected, and (2) most studies of motion perception have used targets presented only in the central position of the visual field, while moving target detection depends a great deal upon the periphery of the field. Objective - the research will examine the way in which the visibility of moving targets is affected by prior knowledge of the target's speed and/or locus in the visual field. Motion perception in the periphery of the visual field will be examined, and possible individual differences in motion sensitivity will be explored. How research contributes -research results will have important implications for Air Force modeling and prediction of target acquisition performance under uncertainty conditions and may aid also in the selection of pilot trainees.

During the first year, studies will be undertaken to (1) determine the possibility of reducing the effect of uncertainty by informational prompts, (2) measure the time course of effect of uncertainty-reducing informational prompts, (3) determine the magnitude of uncertainty effects in peripheral and central regions of the visual field, and (4) determine the correlation between susceptibility to Fraser's movement illusion and other visual abilities as an initial step towards individual differences components in motion perception.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0005, MECHANICAL PROPERTIES OF FOUR HUMAN LONGBONES

H.W. Smith, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (DF056220; F49620-79-C-0183)

AF function - the Air Force operational environment involves exposure to a wide variety of mechanical forces which include flail and impact. These forces are of special significance in relation to the incidence of ejection from high performance aircraft where the probability of disabling injury is unacceptably high. Despite design improvements on ejection seats, dislodging of the limbs occurs frequently when the body is ejected into the wind-blast. The resulting 'flail injuries' are the dislocation of major articulating joints and various longbone injuries. Deficiency - a means is required for obtaining mechanical behavior information on four human longbones (humerus, femur, tibia and fibula). A combined effort of engineering and medical investigations is required to complete a biaxial stress analysis of longbone subjected to combined flexure and torsion. Objective - this effort will provide an orderly method for acquiring data on the mechanical properties of human bone subjected to biaxial stress loadings as related to ejection from high speed aircraft. The information will be applied to improve design of ejection seats, seat restraints and limb restrainer methodology. How research contributes -this study will directly support RO 1.7.1 'criteria for limb flail injury prevention.'

Stiffness and strength tests will be conducted to derive combined stress data on human bone using a specially designed apparatus for applying bending and torsion simultaneously. Resulting parametric data will be directly useful in estimating and assessing ejection-related injury. Post-test microscopic examinations of the fracture initiation points and fracture patterns are planned in the proposed work.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0006, HUMAN INTERACTIONS IN AIRCRAFT MISHAPS

K.W. Wegner, Boston College, Chestnut Hill Campus, School of Education, Dept. of Education, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (DF054930; AFOSR-79-0102)

AF function - this research supports the Air Force flying training program and the Air Force safety program, particularly the work at the Air Force Inspection and Safety Center. Deficiency - very rarely do aircraft accidents occur in the absence of some human interaction, even in single seat aircraft. There is almost always other people who interact with the pilot, either directly or indirectly influencing the events of a mishap. This interaction is poorly specified in accident reports, making it difficult to analyze the sequence of events that lead up to a mishap. Objective - the objective of this research is to study human interaction in USAF aircraft accidents and evaluate different approaches for describing such interactions which will be useful for accident analysis and prevention. How research contributes - the result of this research will be a more thorough understanding of how various individuals interact with a pilot in an accident situation and how this interaction can be described. This information should impact applied research on aircrew training for emergency procedures and the technology of accident analyses.

The principal investigator will examine a sequence-of-events reporting system which would allow for interaction information in capsule form for easy retrieval from computerized accident data files. This reporting system would be based on a taxonomy of human error which would be the input tool for accident information. Research will determine if such a taxonomy

can adequately represent all of the significant human interactions so that they can be reconstructed from a coded data file summary for meaningful analyses.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0007, EFFICIENT COMPUTATIONS AND REPRESENTATIONS OF VISIBLE SURFACES
W.A. Richards, Massachusetts Inst. of Technology, School of Humanities & Social Sciences, Dept. of Psychology, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DF053830; AFOSR-79-0020)

AF function - this research supports the wide variety of AF activities which rely on visual processes as the central components of task completion, with special applications to aircrew simulator visual systems and aircraft display systems. Deficiency - the detection and identification of a surface in the pilot's visual environment is especially critical to a number of tactical flying tasks, particularly those involving low level maneuvers. Just how a surface is perceived, and how this process can lead to a better visual presentation to the pilot in a simulator, is not fully understood. This information is needed for the design of training effective scene content for new generation flight simulators. Objective - the objective of this research is to discover efficient representations of surfaces which can be used for economical scene context modeling in visual simulation. How research contributes - this effort will provide knowledge of the human visual process which can be used in flight simulation, as well as in the design of other types of visual displays such as aircraft cockpit monitors.

This effort will use a new approach recently developed at MIT which views perception as a problem-solving exercise. Potential solutions are reduced to computational algorithms and these algorithms are compared to the performance of the human visual system, which is assumed to be the most parsimonious of all processors. The topics which will be addressed include perspective analysis (surface orientation), texture gradients, orthographic analysis, texture transparency, luminous objections, and motion shear and parallax.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0008, LANDSAT STUDY RELATING SOIL ZINC CONTENT TO DIABETES
I.G. Molnar, Lincoln University, School of Agriculture, Dept. of Agricultural & Natural Resources, *Jefferson City, Missouri* 65101 (NAG13-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

6.0009, PROPOSAL TO PARTICIPATE IN THE TESTING AND EVALUATION OF A TOTAL VIRAL SYSTEM
V.N. Smiley, University of Nevada, System Office, Desert Research Inst., *Reno, Nevada* 89507 (NAG 2-14)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0010, A PRELIMINARY IN VIVO STUDY OF THE EFFECTS OF ELECTRIC STIMULATION ON BONE INGROWTH TO TEXTURED SURFACES OF ORTHOPEDIC IMPLANTS
C.W. Pawluck, Columbia University, College of Physicians & Surgeons, Dept. of Orthopedic Surgery, *630 W. 168th St., New York, New York* 10032 (NAG 3-15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

6.0011, THE AMYLOPHAST AS A GRAVITY SENSING DEVICE IN PLANTS
A.C. Leopold, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Botany, *Ithaca, New York* 14850 (NAGW 3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

6.0012, DISSOLUTION TRANSFER CASTING OF BIOPOLYMERS
D.F. Gibbons, Case Western Reserve University, School of Engineering, Dept. of Biomedical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAG 3-12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

6.0013, COSMOS 1981 EXPERIMENT - CAROTID ARTERIAL FLOW AND PRESSURE MEASUREMENT OF PRIMATES
H.L. Stone, University of Oklahoma, Health Science Center, School of Medicine, Dept. of Physiology & Biophysics, *Box 26901, Oklahoma City, Oklahoma* 73190 (NAS 2-10408)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0014, EFFECTS OF AIRCRAFT NOISE ON HUMAN ACTIVITIES
M.D. Arnoult, Texas Christian University, School of Arts & Sciences, Dept. of Psychology, *2800 S. University Dr., Fort Worth, Texas* 76129 (NAG 1-22)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

6.0015, ETIOLOGY OF DECONDITIONING OF ANTIGRAVITY MUSCLE IN RATS DURING WEIGHTLESSNESS
F.W. Booth, University of Texas, Health Science Center at Houston, School of Medicine, Dept. of Physiology, *Box 20036, Houston, Texas* 77025 (NAS 2-10500)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, STOCHASTIC ANALYSIS OF MULTIPLE-PASS-BAND SPECTRAL CLASSIFICATION SYSTEMS AFFECTED BY OBSERVATION ERRORS
C.P. Tsokos, State University System of Florida, University of South Florida, School of Natural Sciences, Dept. of Mathematics, *4202 Fowler Ave., Tampa, Florida* 33620 (NAG 1-9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0002, MATHEMATICAL ENHANCEMENT OF DATA FROM SCIENTIFIC MEASURING INSTRUMENTS
J.W. Ioup, Xavier University of Louisiana, School of Arts & Sciences, Dept. of Physics, *7325 Palmetto St., New Orleans, Louisiana* 70125 (NAG 1-16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0003, A COMPREHENSIVE MODEL TO DETERMINE THE EFFECTS OF TEMPERATURE AND SPECIES FLUCTUATIONS ON REACTION RATES IN TURBULENT REACTING FLOWS
W. Chinitz, Cooper Union College, School of Engineering, Dept. of Mechanical Engineering, *51 Astor Pl., New York, New York* 10003 (NAG 1-18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0004, SPECTRAL MULTIGRID METHODS FOR THE TWO-DIMENSIONAL COMPRESSIBLE NAVIER-STOKES EQUATIONS WITH NONPERIODIC BOUNDARY CONDITIONS
W.D. Lakin, Old Dominion University, School of Sciences & Health Professions, Dept. of Mathmatical & Computing Sciences, *P.O. Box 6173, Norfolk, Virginia* 23508 (NAG 1-25)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, DYNAMICAL BEHAVIOR OF A FLARING LOOP (A TWO-DIMENSIONAL, TIME-DEPENDENT MAGNETOHYDRODYNAMIC FLUX TUBE MODEL)
S.T. Wu, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Mechanical Engineering, *Huntsville, Alabama* 35807 (NAGW 9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0002, COLLISION PROCESSES INVOLVING EXCITED ATOMS
F.T. Smith, S R I International, *300 Ravenswood Ave., Menlo Park, California* 94025 (PHY78-09647)

This is a project in atomic and molecular physics in which the interactions of atoms in excited states are studied, continuing grant PHY76-14436 A02.

The collisional interactions of electronically excited and ground state atomic beams are being investigated in two sophisticated molecular beam scattering facilities. In one facility, the energy and angular distributions of scattered neutral and ionic particles will be measured, using both time-of-flight and electrostatic energy analysis. Atom-atom and atom-molecule inelastic processes, including electronic excitation and collisional ion-pair formation, will be studied; coincidence techniques will be used to investigate the important Penning ionization reaction. Another experimental facility will use laser pumping techniques to modify and define the excited state beam composition for metastable rare gas projectiles allowing measurements of collisional excitation transfer rates for a specified excited state. Similar laser techniques will be applied to the excitation of alkali target atoms for investigations of other collisional processes, including excited state-excited state reactions. This program is a new area of atomic collisions concerned with the detailed dynamics of excited state collisions at elevated energies. Since little detailed dynamic information is available for these excited state interactions, many opportunities exist for this work to contribute to the understanding of the basic collisional energy transfer process.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0003, EXPERIMENTS WITH PHASE TRANSITIONS AT VERY HIGH PRESSURE
I.L. Spain, Colorado State University, School of Natural Sciences, Dept. of Physics, *Fort Collins, Colorado* 80523 (NAGW 8)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

8.0004, INVESTIGATION OF MICROSCOPIC AND MACROSCOPIC PLASMA PROPERTIES WITH APPLICATION TO SPACE PLASMAS
G.R. Joyce, University of Iowa, School of Liberal Arts, Dept. of Physics & Astronomy, *Jessup Hall, Iowa City, Iowa* 52240 (ATM76-82739)

This grant considers the application of numerical methods and analytical approximations to study the microscopic and macroscopic properties of space plasma systems. Specific areas to be studied include the following: the development and characteristics of potential double layers using solutions of the Vlasov equation and numerical simulations; the formation of double layers in the magnetospheres of Earth and Jupiter and associated particle acceleration and radio emissions; the observable effects of 100 kilovolt electrons and ions accelerated by Jupiter's moon Io; the development of turbulent cascades in magnetohydrodynamic plasmas; and the structure of the Jovian magnetosphere including the cold plasma, the current sheet and the energetic particles.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0005, AN ULTRAVIOLET IMAGING DETECTOR FOR SHUTTLE ASTRONOMY
H.W. Moos, Johns Hopkins University, School of Arts & Sciences, Dept. of Physics, *34th & Charles Sts., Baltimore, Maryland* 21218 (NAGW 16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0006, RELATIVITY, COSMOLOGY, AND RELATIVISTIC ASTROPHYSICS
W.H. Press, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (PHY78-09616)

Theoretical research in gravitational physics currently supported under NSF grant PHY76-14852 A01 will be continued. The Harvard group will carry out a program of research in relativity, cosmology, and relativistic astrophysics. Specific problems which are to be examined include: regularization and renormalization techniques in the quantum theory of gravitation; nonspherical collapse of stars to black holes, and collisions of black holes; dissipative properties of self-gravitating, stellar-dynamic techniques for identifying gravitational radiation in numerical calculations; interaction of gravitational radiation with matter; and other related problems.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0007, INVESTIGATION OF SOME CRITICAL PHENOMENA IN THE N-VORTEX SYSTEM WITH APPLICATION TO LARGE-SCALE TURBULENT NOISE SPECTRA
J.E. Young, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAG 1-12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0008, HIGH-RESOLUTION SPECTROSCOPY EQUIPMENT

H.H. Stroke, New York University, Washington Square & University College of Arts & Sciences, Dept. of Physics, *421 1st Ave., New York, New York* 10012 (PHY76-24470 A01)

This grant will provide for new capital equipment for the high resolution spectroscopy laboratory of New York University. The principal item is a tunable dye laser, which will extend the spectroscopic capabilities in both resolution and sensitivity.

This work is a continuation of that currently supported under NSF grant PHY-7624470.

SUPPORTED BY U.S. National Science Foundation, Directorate for Biological Behavioral & Social Sciences, Div. of Physiology Cellular & Molecular Biology

8.0009, THEORY AND DESIGN OF THE TANDEM JUNCTION SOLAR CELL WITH FRONT AND BACK COLLECTION

C.P. Garadia, Cleveland State University, School of Engineering, Dept. of Electrical Engineering, *1983 E. 24th, Cleveland, Ohio* 44115 (NAG 3-23)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

8.0010, DIAGNOSTIC EXPERIMENTS ON SUPERSONIC JET NOISE

D.K. McLaughlin, Oklahoma State University, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *Engineering N., Stillwater, Oklahoma* 74074 (NAG 1-10)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0011, MEASUREMENT OF TEMPERATURE AND DENSITY FLUCTUATIONS IN TURBULENCE USING AN ULTRAVIOLET LASER

G.A. Massey, Oregon Graduate Center, Graduate School, Dept. of Electrical Engineering, *19600 N.W. Walker Rd., Beaverton, Oregon* 97005 (NAG 2-9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0012, HYDRODYNAMICS AND TURBULENCE IN QUANTUM FLUIDS

R.J. Donnelly, Oregon State Higher Education System, University of Oregon, School of Arts & Sciences, Dept. of Physics, *Johnson Hall, Eugene, Oregon* 97403 (NAG 2-7)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0013, SOME PROBLEMS IN THEORETICAL ATOMIC PHYSICS

R. Shakeshaft, Texas A & M University, College Station Campus, School of Science, Dept. of Physics, *College Station, Texas* 77843 (PHY77-07406 A01)

Research initiated on NSF grant PHY77-07406 will be continued. Problems in theoretical atomic physics that will be worked on include: 1) the development of the theory accounting for the observed asymmetry in the cusp of the differential cross-section for charge transfer to the continuum; 2) the determination of (a) the convergence properties of expansions in powers of 1/n, where n is the principal quantum number, of radial hydrogenic matrix elements and (b) the n-dependence of the resonance energies of an excited atom in a static electric field; 3) relativistic effects in electron capture by protons from hydrogen atoms at very high velocities; 4) Lamb shift and vacuum fluctuation effects on a particle bound to a conducting wall; and 5) a single expansion of the form factor of an atom, valid over the entire range 0 is less than or equal to K which is less than or equal to infinity where K is the reciprocal wavelength.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Mathematical & Computer Sciences

8.0014, MASS FLOW VELOCITY DISTRIBUTIONS IN THE SOLAR CHROMOSPHERE

D.A. Tripp, Utah Higher Education System, Weber State College, Undergraduate School, Dept. of Physics, *3800 Harrison Blvd., Ogden, Utah* 84403 (NAGW 19)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0015, THEORETICAL STUDIES OF CHEMICAL REACTIONS INVOLVING EXCITED ELECTRONIC STATES

J.B. Delos, College of William & Mary, Williamsburg College, School of Arts & Sciences, Dept. of Physics, *Ewell Hall, Williamsburg, Virginia* 23185 (CHE78-01595)

A number of fundamental difficulties have arisen in the theory of electronic excitations in molecular collisions. The conventional form of the theory leads to certain symmetry-violating couplings, unphysically large collision cross-sections for some processes, and inappropriate asymptotic behavior of some matrix elements. Many of these were resolved by Professor Delos' development of a quantum form of 'electron-translation-factors,' which describe the motion of the electrons as they are carried with the nuclei. These seemingly unimportant factors were found to have substantial effects which resolve the above-mentioned difficulties and lead to corrections to many coupling matrix elements. Continued investigations on the effects of these factors are planned, especially seeking numerical tests of the new form of the theory.

Collisions involving electron detachment have in the past been described by a 'complex-potential' model, but the simplest forms of this model are not in agreement with all the experimental data. A more general approach to the theory of these processes is being developed, and will be used to calculate the cross-sections (and corresponding rate constants) for elastic scattering and electron detachment, and the energy and angular distribution of detached electrons.

This research represents a continuation of that currently supported by Foundation grant CHE-7516119.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0016, PERFORMANCE IMPROVEMENT OF LEAD-TIN-SELENIUM (PB$_x$-XSNXSE) SEMICONDUCTOR LASERS THROUGH USE OF FREQUENCY SELECTIVE OPTICAL FEEDBACK

G.E. Copeland, Old Dominion University, School of Sciences & Health Professions, Dept. of Physics & Geophysical Science, *P.O. Box 6173, Norfolk, Virginia* 23508 (NAG 1-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0017, PROPAGATION OF SOUND THROUGH THE EARTH'S ATMOSPHERE

A.J. Zuckerwar, Old Dominion University, School of Sciences & Health Professions, Dept. of Physics & Geophysical Science, *P.O. Box 6173, Norfolk, Virginia* 23508 (NAG 1-15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0018, RESEARCH RELATED TO THE TECHNOLOGY OF RADIATION MACHINERY AND HIGH POWER GAS LASERS
A. Hertzberg, University of Washington, School of Engineering, Dept. of Aeronautics & Astronautics, *206 Guggenheim Hall, Seattle, Washington* 98105 (NAG 3-16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SCIENTIFIC ACTIVITIES OF THE HIGH RESOLUTION ULTRAVIOLET SPECTROMETER AND POLARIMETER FOR THE SOLAR MAXIMUM MISSION
J.M. Beckers, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAS 5-25955)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0002, 15 UM DETECTORS FOR SHUTTLE INFRARED TELESCOPE FACILITY
A. Davidson, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAS 2-10436)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0003, A LABORATORY STUDY OF SILICATE CONDENSATION
K.L. Day, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (AST78-11306)

Laboratory apparatus for studying aspects of silicate condensation from two different approaches has been constructed. One set of experiments explores the complexities of the nucleation process when silicates nucleate from a mixture of SiO and Mg vapors. The other experiments study surface condensation of silicates as thin films from the vapor state. Both of these approaches are yielding data which are of use to astronomers and cosmochemists interested in primordial condensation.

It is hoped to further quantify the results, obtain optical constants for materials likely to form in space, and expand the experiments to more complex systems which more closely approximate astrophysical conditions.

This research was supported under grant AST 76-21385.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0004, SUBMILLIMETER LINE ASTRONOMY ON THE NASA 91.5CM AIRBORNE TELESCOPE
T.G. Phillips, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NAG 2-1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0005, INTERNATIONAL SUN-EARTH EXPLORER DATA REDUCTION
R.A. Helliwell, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (NAS 5-25744)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0006, INTERNATIONAL SUN-EARTH EXPLORERS-A AND -B DATA REDUCTION AND ANALYSIS FOR THE ENERGETIC PARTICLES FLUX EXPERIMENT
K.A. Anderson, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAS 5-25980)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0007, INTERNATIONAL SUN-EARTH EXPLORER-A DATA REDUCTION AND ANALYSIS FOR THE QUASI-ELECTRIC FIELDS EXPERIMENT
F.S. Mozer, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAS 5-25770)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0008, INTERNATIONAL SUN-EARTH EXPLORERS A & B DATA REDUCTION AND ANALYSIS FOR THE MAGNETIC FIELD INVESTIGATION
C.T. Russell, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California* 90024 (NAS 5-25772)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0009, THEORETICAL WORK IN HIGH ENERGY ASTROPHYSICS AND EXTRAGALACTIC ASTRONOMY
J.E. Felten, University of California, San Diego Campus, Graduate School, Dept. of Physics, *P.O. Box 109, La Jolla, California* 92037 (NAGW 12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0010, SPECTROPHOTOMETRY OF QUASI-STELLAR OBJECTS
J.S. Miller, University of California, Santa Cruz Campus, Lick Observatory, *Mount Hamilton, California* 95140 (AST76-20843)

Though their existence was recognized over 12 years ago, the quasars (short for 'quasi-stellar radio sources', but also called 'quasi-stellar objects' or 'QSOs') remain enigmatic objects. Many astronomers believe they represent very energetic events taking place at great distances, but even their distances are a matter of dispute. The objective of the research is to obtain fundamental quantitative data on the optical spectra of a large sample of quasars. A systematic survey of a fairly large sample of QSOs using the Lick Observatory 120-inch cassegrain image-tube scanner to obtain moderate-resolution spectrophotometry will be carried out. Such parameters as emission-line intensities and profiles, continuum spectral energy distributions, and polarizations will be measured. These data will be used to investigate the physical processes taking place in QSOs and as a basis for comparison with published models for them. Also, evidence for systematic behavior in the optical spectra of QSOs as functions of apparent magnitude, red-shift, radio properties, and degrees of variability will be a major component of the study. The information on the physical conditions in quasars will be analyzed for clues to the relationship they may have to other kinds of objects and to the role they play in the universe in general.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0011, A THREE-DIMENSIONAL OBSERVATIONAL STUDY OF THE SOLAR 5-MINUTE OSCILLATIONS
E.J. Rhodes, University of Southern California, School of Letters Arts & Sciences, Dept. of Astronomy, *3551 University Ave., Los Angeles, California* 90007 (NAGW 13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0012, STUDY OF X-RAY EMISSION FROM A & A PECULIAR STARS
Unknown, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAG 8-300)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

10.0013, A PROBE OF THE CORONA WIND BOUNDARY IN THE HR DIAGRAM
Unknown, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAG 8-316)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

10.0014, OPTICAL & INFRARED STUDIES OF STARS IN REFLECTION NEBULAE
Unknown, Wesleyan University, Graduate School, *Middletown, Connecticut* 06457 (NAG 8-335)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

10.0015, STRUCTURE OF THE LOCAL UNIVERSE AND THE STATISTICAL PROPERTIES OF GALAXIES
R.B. Tully, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (AST76-12159 A01)

The radiation emitted by neutral hydrogen (HI) has been detected from 1000 nearby galaxies, the vast majority of them observed for red-shifts at radio wavelengths for the first time. The combination of these results with approximately 600 red-shifts in the literature will make it possible to map the extragalactic neighborhood out to distances where galaxies are thought to recede at a velocity of 3000 km/s in much greater detail than possible previously. For red-shifts corresponding to 1000 km/s, our sample should be complete for all but extreme systems (e.g., the smallest dwarfs or compacts).

In addition to the red-shift, hydrogen flux (HI mass) and a profile width (elated to total mass) will be measured. Of major importance is a correlation discovered between the profile width and absolute galaxian luminosity which promises to provide a superior method of obtaining distances to galaxies. Consequently, it is potentially possible to locate all of the measured galaxies three-dimensionally in space independently of red-shift.

Major questions that this wealth of data will help resolve are: a) How do galaxies tend to group, on scales from small groups through to the supercluster? b) Are these groups or the supercluster stable or dissipating? c) How much angular momentum do groups or the supercluster contain? d) Is the Hubble expansion isotropic locally and what is the Hubble Constant? e) Is there evidence within groups of non-Doppler red-shifts? f) What is the luminosity function of galaxies based on this 'complete' sample? g) What are the statistics of the morphological properties of galaxies, including peculiarities?

This is a continuation of research done under grant AST 76-12159.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0016, SUBMILLIMETER ASTRONOMY AT THE NASA UNIVERSITY OF HAWAII 3-METER INFRARED TELESCOPE FACILITY
R.H. Hildebrand, University of Chicago, School of Physical Sciences, Dept. of Physics, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (NAGW 4)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Office of Space Science

10.0017, INTERPLANETARY MONITORING PLATFORM-J DATA REDUCTION AND ANALYSIS
J.A. Simpson, University of Chicago, School of Physical Sciences, Dept. of Physics, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (NAS 5-25731)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0018, HARDWARE FOR UNIFIED RADIO AND PLASMA WAVE EXPERIMENT INTERNATIONAL SOLAR POLAR MISSION INVESTIGATION
D.A. Gurnett, University of Iowa, School of Liberal Arts, Dept. of Physics & Astronomy, *Jessup Hall, Iowa City, Iowa* 52240 (NAS 5-25999)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0019, INTERPLANETARY MONITORING OF PLATFORM-H & J SPACECRAFT ION AND ELECTRON EXPERIMENT
G. Gloeckler, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NAS 5-25735)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0020, INTERPLANETARY MONITORING PLATFORM-J/PLASMA EXPERIMENT - DATA REDUCTION AND ANALYSIS
H.S. Bridge, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAS 5-25790)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0021, EVOLUTION OF NON-THERMAL RADIO SOURCES
W.A. Dent, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *Amherst, Massachusetts* 01002 (AST78-04792)

The variable radio source monitoring programs being conducted at 2.7 gHz on the NRAO 300-foot antenna, at 7.8 gHz and 15.5 gHz on the 120-foot Haystack antenna, and at 31.4 gHz and 90.0 gHz on the 36-foot NRAO and 45-foot University of Massachusetts millimeter wave antennas will be continued.

These data will be used to study the long-term evolution of quasi-stellar objects, to investigate physical models of radio source outbursts, to search for correlations with variations at optical frequencies, and to help understand the relationship between radio source outbursts and the observed superluminal changes in source structure obtained from very long baseline interferometry.

This is a continuation of grant AST 76-06808 A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0022, GASEOUS HALOES OF GALAXIES
D. York, Princeton University, School of Natural Sciences, Dept. of Astrophysical Sciences, *Box 430, Princeton, New Jersey* 08540 (NAGW 10)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Office of Space Science

10.0023, REDUCTION AND ANALYSIS OF STELLAR X-RAY SPECTRAL AND POLARIMETRIC DATA OBTAINED WITH THE COLUMBIA UNIVERSITY ORBITING SOLAR OBSERVATORY 8
R. Novick, Columbia University, Graduate School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (NAGW 18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0024, OPTICAL MONITORING OF CYGNUS X-1, X PERSEI, AND OTHER X-RAY SOURCES
J.C. Kemp, Oregon State Higher Education System, University of Oregon, School of Liberal Arts, Dept. of Physics, *1472 Kincaid St., Eugene, Oregon* 97401 (NAGW 7)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0025, OPERATION AND MANAGEMENT OF THE LUNAR AND SATELLITE LASER RANGING GROUND STATION EQUIPMENT AT MCDONALD OBSERVATORY, TEXAS
E.C. Silverberg, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NAS 5-25948)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0026, IRREGULAR SATELLITES AND TROJAN ASTEROIDS STUDY
Unknown, Utah Higher Education System, University of Utah, Graduate School, *310 Park Bldg., Salt Lake City, Utah* 84112 (NAGW 11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

GENERAL

11.0001, SPACEMOBILE OPERATION AND MANAGEMENT OF AEROSPACE EDUCATION SERVICES PROJECT
K.E. Wiggins, Oklahoma State University, School of Education, Dept. of Curriculum & Instruction, *101 Gunderson Hall, Stillwater, Oklahoma* 74075 (NASW 3313)

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N80-22255* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 120
Mar. 1980 93 p
(NASA-SP-7037(120)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography contains abstracts for 297 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1980. A.R.H.

N80-22256* National Aeronautics and Space Administration, Washington, D. C.
A CUMULATIVE INDEX TO AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 118
Jan. 1980 779 p Revised
(NASA-SP-7037(118)) Avail: NTIS HC $10.00 CSCL 01A

Subject, personal author, corporate author, contract, and report number cumulative indexes are provided for documents cited in Aeronautical Engineering: A Continuing Bibliography from February 1979 through January 1980. (NASA SP 7037 supplements 106 through 117). A.R.H.

N80-22257# Sikorsky Aircraft, Stratford, Conn.
ANALYSIS OF HELICOPTER MAINTENANCE FAULT ISOLATION CRITERIA/TECHNIQUES Final Report, Oct. 1977 - Apr. 1979
Thomas N. Cook Oct. 1979 173 p refs
(Contract DAAJ02-77-C-0071; DA Proj. 1L2-62209-AH-76)
(AD-A080596; SER-510022; USARTL-TR-79-21) Avail: NTIS HC A08/MF A01 CSCL 01/3

The problems associated with fault isolation maintenance in Army aviation were investigated. The investigation included a detailed engineering analysis of historical maintenance data on the CH-54 helicopter and surveys of selected Army field activities throughout the United States. The investigation confirmed that fault isolation maintenance is a significant factor in the cost of operating Army helicopters. The most frequent criticism voiced by Army personnel in the field concerns the generally poor quality of troubleshooting data in current aircraft maintenance publications. In response to this problem, an improved approach to the development of fault isolation maintenance data for complex systems was developed. Called FIAT (Fault Isolation Analysis Technique), the proposed approach greatly facilitates the identification of symptom/cause relationships and the collection, processing and organization of data required for the preparation of maintenance manuals. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N80-22258 Illinois Univ. at Urbana-Champaign.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF TRANSONIC FLOW IN THE THROAT REGION OF ANNULAR AXISYMMETRIC, SUPERSONIC NOZZLES Ph.D. Thesis
Jonathan Craig Dutton 1979 175 p
Avail: Univ. Microfilms Order No. 8009020

A direct means of analyzing the throat flowfields in a variety of two-dimensional nozzle configurations including axisymmetric, annular, and planar nozzles was developed. Flowfield static pressure measurements were obtained for four nozzle configurations including an axisymmetric, Laval nozzle and three annular ones. Half-section cylindrical models were constructed and mounted on a splitter plate whose surface corresponds to a symmetry for the axisymmetric geometries under consideration. Readings from a grid of pressure taps arranged on the splitter plate allowed the determination of the static pressure fields in the nozzle throats. For all four cases tested, it was found that the agreement between the theoretical and experimental results is quite good through a significant region of the throat. Only near the bounding walls in the throat inlet region was there a noticeable discrepancy for some of the cases. Dissert. Abstr.

N80-22259 Catholic Univ. of America, Washington, D. C.
THE INFLUENCE OF YAW ANGLE UPON THE VORTEX WAKES OF STATIONARY AND VIBRATING CYLINDERS Ph.D. Thesis
Steven Eric Ramberg 1978 125 p
Avail: Univ. Microfilms Order No. 7816944

The vortex shedding frequency, the shedding angle, the base pressure, the vortex formation length and the wake width were measured for both stationary and vibrating yawed cylinders in the range of Reynolds numbers Re = 160 to 1100. The influence of end conditions was assessed for free ended cylinders of varying end geometries and for cylinders fitted with adjustable end-plates. It is concluded that the use of the Independence Principle is not valid for separated, yawed cylinder flows except in two special cases. The first case concerns the transverse vibration of the yawed cylinders when the vortex shedding processes are captured in a manner equivalent to the use of the Cosine Laws. The second instance is a result of substantial end effects upon the wakes of finite-length, stationary yawed cylinders. The universal Strouhal number concept for scaling the vortex wakes of bluff bodies at normal incidence was found to be valid for inclined cylinders. Dissert. Abstr.

N80-22260*# National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC WING DFVLR-F4 AS EUROPEAN TEST MODEL

G. Redeker and Norbert Schmidt Jan. 1980 12 p Transl. into ENGLISH from Nachrichten-Tech. Z. (West Germany), Jun. 1979 p 36-39 Original language document announced as A79-41234 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by DFVLR, Brunswick
(Contract NASw-3199)
(NASA-TM-75752) Avail: NTIS HC A02/MF A01 CSCL 01A

A transonic wing, the DFVLR-F4 was designed and tested as a model in European transonic wind tunnels and was found to give performance improvements over conventional wings. One reason for the improvement was the reduction of compression shocks in the transonic region as the result of improved wing design. E.D.K.

N80-22261*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VISCOUS-INVISCID CALCULATIONS OF JET ENTRAINMENT EFFECTS ON THE SUBSONIC FLOW OVER NOZZLE AFTERBODIES
Richard G. Wilmoth Apr. 1980 79 p refs
(NASA-TP-1626; L-13362) Avail: NTIS HC A05/MF A01 CSCL 01A

A viscous-inviscid interaction model was developed to account for jet entrainment effects in the prediction of the subsonic flow over nozzle afterbodies. The model is based on the concept of a weakly interacting shear layer in which the local streamline deflections due to entrainment are accounted for by a displacement-thickness type of correction to the inviscid plume boundary. The entire flow field is solved in an iterative manner to account for the effects on the inviscid external flow of the turbulent boundary layer, turbulent mixing and chemical reactions in the shear layer, and the inviscid jet exhaust flow. The components of the computational model are described, and numerical results are presented to illustrate the interactive effects of entrainment on the overall flow structure. The validity of the model is assessed by comparisons with data obtained form flow-field measurements on cold-air jet exhausts. Numerical results and experimental data are also given to show the entrainment effects on nozzle boattail drag under various jet exhaust and free-stream flow conditions. Author

N80-22262*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va
INVESTIGATION OF THE FLOW FIELD SURROUNDING CIRCULAR-ARC BOATTAIL NOZZLES AT SUBSONIC SPEEDS
William K. Abeyounis and Lawrence E. Putnam May 1980 51 p refs
(NASA-TP-1633; L-13318) Avail: NTIS HC A04/MF A01 CSCL 01A

The effects of jet exhaust on the subsonic flow field surrounding boattail nozzles with attached and separated boundary layers were investigated. Measurements of local Mach numbers and flow angles were made at free-stream Mach numbers of 0.60 and 0.80 at an angle of attack of 0 deg. Jet exhaust flow was simulated with a solid cylindrical sting and with high pressure air at jet-nozzle total pressure ratios of 2.9 and 5.0. Results show strong effects of the jet-wave structure on the external flow field. The predicted local Mach numbers and flow angles for attached-flow nozzles with solid jet simulators obtained by using subsonic inviscid/viscous-flow theory are in good agreement with experimental data. Prediction of nozzle surface pressure distributions which include jet-entrainment effects also agree with experimental data for attached-flow nozzles with high pressure air jets. R.E.S.

N80-22263*# National Aeronautics and Space Administration, Washington, D. C.
A FINITE ELEMENT METHOD FOR THE COMPUTATION OF TRANSONIC FLOW PAST AIRFOILS
A. Eberle Feb. 1980 61 p refs Transl. into ENGLISH of "Eine Methode finiter Elemente zur Berechnung der Transonischen Potential-Stroemung um Profile", Rept. MBB-UFE-1352-0 Messerschmidt-Boelkow G.m.b.H., Munich, 23 Sep. 1977 63 p Translation was announced as N79-23935 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-75749; MBB-UFE-1352-0) Avail: NTIS HC A04/MF A01 CSCL 01A

A finite element method for the computation of the transonic flow with shocks past airfoils is presented using the artificial viscosity concept for the local supersonic regime. Generally, the classic element types do not meet the accuracy requirements of advanced numerical aerodynamics requiring special attention to the choice of an appropriate element. A series of computed pressure distributions exhibits the usefulness of the method. E.D.K.

N80-22264*# North Carolina State Univ. at Raleigh. Center for Acoustical Studies.
EXPERIMENTAL STUDY OF AIRFOIL TRAILING EDGE NOISE: INSTRUMENTATION, METHODOLOGY AND INITIAL RESULTS M.S. Thesis
Mark B. Manley 1980 199 p refs
(Grant NsG-1377)
(NASA-CR-163007) Avail: NTIS HC A09/MF A01 CSCL 01A

The mechanisms of aerodynamic noise generation at the trailing edge of an airfoil is investigated. Instrumentation was designed, a miniature semiconductor strain-gauge pressure transducer and associated electronic amplifier circuitry were designed and tested and digital signal analysis techniques applied to gain insight into the relationship between the dynamic pressure close to the trailing edge and the sound in the acoustic far-field. Attempts are made to verify some trailing-edge noise generation characteristics as theoretically predicted by several contemporary acousticians. It is found that the noise detected in the far-field is comprised of the sum of many uncorrelated emissions radiating from the vicinity of the trailing edge. These emissions appear to be the result of acoustic energy radiation which has been converted by the trailing-edge noise mechanism from the dynamic fluid energy of independent streamwise 'strips' of the turbulent boundary layer flow. A.R.H.

N80-22265*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THEORETICAL PREDICTION OF NONLINEAR PROPAGATION EFFECTS ON NOISE SIGNATURES GENERATED BY SUBSONIC OR SUPERSONIC PROPELLER OR ROTOR-BLADE TIPS
Raymond L. Barger May 1980 18 p refs
(NASA-TP-1660; L-13388) Avail: NTIS HC A02/MF A01 CSCL 01A

The nonlinear propagation equations for sound generated by a constant speed blade tip are presented. Propagation from a subsonic tip is treated as well as the various cases that can occur at supersonic speeds. Some computed examples indicate that the nonlinear theory correlates with experimental results better than linear theory for large amplitude waves. For swept tips that generate a wave with large amplitude leading expansion, the nonlinear theory predicts a cancellation effect that results in a significant reduction of both amplitude and impulse. Author

N80-22266*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FULL-SCALE WIND TUNNEL INVESTIGATION OF THE ADVANCED TECHNOLOGY LIGHT TWIN-ENGINE AIRPLANE (ATLIT)
James L. Hassell, Jr., William A. Newsom, Jr., and Long P. Yip May 1980 212 p refs
(NASA-TP-1591; L-13135) Avail: NTIS HC A10/MF A01 CSCL 01A

An investigation was conducted to evaluate the aerodynamic performance, stability, and control characteristics of the Advanced Technology Light Twin Engine airplane (ATLIT). Data were measured over an angle of attack range from -4 deg to 20 deg for various angles of sideslip between -5 deg and 15 deg at Reynolds numbers of 0.0000023 and 0.0000035 for various settings of power and flap deflection. Measurements were also made by means of special thrust torque balances to determine the installed propeller characteristics. Part of the investigation was devoted to drag cleanup of the basic airplane and to the evaluation of the effect of winglets on drag and stability. E.D.K.

N80-22267# Northrop Corp., Hawthorne, Calif. Aircraft Group.
TRANSONIC KERNEL FUNCTION METHOD FOR UNSTEADY FLOW CALCULATIONS USING A UNIFIED LINEAR PRESSURE PANEL PROCEDURE Final Report, 1 Mar. 1978 - 30 May 1979
D. D. Liu, W. S. Di, and M. T. Landahl Wright-Patterson AFB, Ohio AFFDL Oct. 1979 107 p refs
(Contract F33615-78-C-3202)
(AD-A080227; NOR-79-52; AFFDL-TR-79-3065) Avail: NTIS HC A06/MF A01 CSCL 20/4

A transonic kernel function method for unsteady flow calculations was developed. A unified linear pressure panel procedure is established to solve for two-dimensional problems in the subsonic, transonic, and supersonic flow regimes; consequently, a TLP2D computer code was developed. Numerical results are presented for pitching or flapping airfoils in these linear and nonlinear flow regimes. The mixed kernel function procedure is applied to a pitching Guderley airfoil in sonic flow. Comparisons with other results and discussions are given. Additional analytical studies include Landahl's general formulation of the phase correction method and the kernel function formulation of the Eckhaus-Landahl shock-jump model. Finally, assessments of and recommendations for the present work are given. GRA

N80-22268# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATION OF AN IMPROVED PARACHUTE TEST DATA ACQUISITION SYSTEM M.S. Thesis
Gary Alan Richardson Dec. 1979 109 p refs
(AD-A080240; AFIT/GCS/EE/79-13) Avail: NTIS HC A06/MF A01 CSCL 14/3

This project confirms the feasibility of a sixteen channel, self-contained data acquisition system that would be suitable to store data obtained during a parachute performance evaluation drop. The overall system is discussed in modular fashion to allow generalization to other portable data acquisition systems that must accept data at high rates but over relatively short time intervals. The storage medium for the proposed system utilizes magnetic bubble memory devices. GRA

N80-22269# Avco Corp., Wilmington, Mass.
PROJECTILE/SABOT DISCARD AERODYNAMICS Final Report
David Siegelman and Peter Crimi Aberdeen Proving Ground, Md. BRL Dec. 1979 92 p refs
(Contract DAAK11-77-C-0080)
(AD-A080538; AD-E430367; ARBRL-CR-00410) Avail: NTIS HC A05/MF A01 CSCL 19/1

An engineering analysis procedure which describes the sabot discard process for gun-launched projectiles has been modified in order to provide an improved tool for investigating the effects of sabot, projectile and launch parameters upon near field dispersive forces. Experimental test data generated by BRL has been used to formulate an improved engineering model of the interaction flow field which develops about the projectile/sabot petal package during the removal process. The experimental data indicated that individual compression wave intersections and reflections are present within the annular flow passage. In order to model this behavior, an integrated flow element approach utilizing local shock/expansion procedures has been evolved. GRA

N80-22270# Southeastern Center for Electrical Engineering Education, Inc., Orlando, Fla.
STABILITY ANALYSIS OF THE LOWER BRANCH SOLUTIONS OF THE FALKNER-SKAN EQUATIONS Final Technical Report, 17 May - 31 Jul. 1979
G. R. Verma, Will L. Hankey, and S. J. Scherr Wright-Patterson AFB, Ohio AFFDL Jul. 1979 41 p refs
(Contract F49620-79-C-0038; AF Proj. 2307)
(AD-A080743; AFFDL-TR-79-3116) Avail: NTIS HC A03/MF A01 CSCL 20/4

The stability of the Lower-Branch solutions of the Falkner-Skan boundary layers has been analyzed. A perturbation analysis of these boundary layers was performed resulting in the Rayleigh stability equation. Eigenvalue solutions were obtained for the Rayleigh equation for different adverse pressure gradient values. Propagation velocity and amplification factors were computed over the entire range of unstable wave numbers. All retarded flows were found to unstable for a small range of frequencies, with the amplification factor increasing as the extent of reversed flow increased. GRA

N80-22271# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF FIRST AND SECOND ORDER TECHNIQUES FOR COMPUTING OPTIMAL HORIZONTAL GLIDING TRAJECTORIES
Walton E. Williamson, Jr. 1980 17 p refs Presented at 18th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 14 Jan. 1980
(Contract EY-76-C-04-0789)
(SAND-79-1347; CONF-800104-2) Avail: NTIS HC A02/MF A01

The problem of numerically computing maximum endurance subsonic gliding trajectories which remain in a horizontal plane and return to the original starting point is considered. The control is parameterized and numerical solutions for two different types of parameterization are shown. Piecewise continuous polynomial control approximations are shown to produce consistent results for the trajectories which should be very good approximations for the true optimal solution. DOE

N80-22272# European Space Agency, Paris (France).
CALCULATION OF THE INTERFERENCE EFFECTS BETWEEN THE ENGINE WING AND THE BASE WING OF A CIVIL AND MILITARY TRANSPORT AIRCRAFT BY THE VORTEX LATTICE METHOD
W. Schroeder Dec. 1978 101 p refs Transl. into ENGLISH of "Berechnung der Interferenzwirkung Zwischen Triebwerks- und Basisfluegel am Zivil-Militaerischen Transporter nach dem Wirbelleiterverfahren", Rept. DLR-IB-151-77/19 DFVLR and VFW-Fokker G.m.b.H., Bremen, Dec. 1977 Original report in GERMAN previously announced as X79-71705
(ESA-TT-493; DLR-IB-151-77/19) Avail: NTIS HC A06/MF A01

For incompressible symmetric flow, calculations of the interference between engine and basis wing of the VFW-Fokker 614 civil-military transport aircraft model were performed. The following parameters were used: angle of attack 0, 3, and 5 deg for three different engine wings each with -10%, 10%, 30% or 50% overlap between engine and basic wing. The results of the linear and nonlinear calculations are discussed. Author (ESA)

N80-22273# European Space Agency, Paris (France).
CALCULATION OF THE TURBULENT BOUNDARY LAYER ON AN INFINITE SWEPT WING USING A THREE-DIMENSIONAL MIXING LENGTH MODEL
Gert Reinhard Schneider Jul. 1979 70 p refs Transl. into ENGLISH of "Die Berechnung der Turbulenten Grenzschicht am Schiebenden Fluegel Unendlicher Spannweite Mittels eines Dreidimensionalen Mischungsweg modells", Rept. DLR-FB-77-73 DFVLR, Goettingen, West Germany, May 1978 Original report in GERMAN previously announced as X79-72041
(ESA-TT-534; DLR-FB-77-73) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 28,60

Experimental observations of three-dimensional turbulent boundary layers show that the direction of the shear stress is in general not parallel to the direction of the mean velocity gradient. Following this observation for the Reynolds shear stresses, a generalized mixing length model is developed based on a non-isotropically distributed eddy viscosity. The isotropic mixing length model currently used for three-dimensional flows is included as a special case. Calculations are carried out for the infinite swept wing situation of the VAN DEN BERG, ELSENAR and BOELSMA experiment. The comparisons show an improvement of the prediction over the isotropic calculations. Author (ESA)

N80-22274# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ACTIVITIES IN AEROSPACE RESEARCH Annual Report, 1978
1979 208 p refs Original contains color illustrations
Avail: NTIS HC A10/MF A01

Aerodynamics, wind tunnel testing, structures, propulsion, physics, and materials science are among the topics discussed.

Applications of aerospace research in industry are covered. Patents and publications issued during the year are listed. Author (ESA)

N80-22275# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
SUPERCRITICAL WING DESIGN STUDIES FOR TRANSPORT AIRCRAFT. VOLUME 1: WING DESIGN AND WIND TUNNEL MEASUREMENTS Final Report
Guenter Binder, Hartmut Buers, and Hans-Joerg Proksch Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1979 94 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol. 2 Vol.
(BMFT-FB-W-79-06-Vol-1) Avail: NTIS HC A05/MF A01

The design work and wind tunnel measurements for a supercritical wing for a transport aircraft to supplement the airbus A 300 are described. Author (ESA)

N80-22276# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Theoretical Aerodynamics.
SUPERCRITICAL WING DESIGN STUDIES FOR TRANSPORT AIRCRAFT. VOLUME 2: THEORETICAL STUDIES Final Report
Willy Fritz, Stefan Leicher, Wolfgang Schmidt, and Hans-Werner Stock Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1979 148 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol. 2 Vol.
(BMFT-FB-W-79-07-Vol-2) Avail: NTIS HC A07/MF A01

The improvement of currently existing computer methods for the design of supersonic transport aircraft was studied. This was achieved by modifying both equation and boundary conditions. Wind tunnel wall effects were included as was viscous drag. The detailed comparisons document the present status of the different methods. Author (ESA)

N80-22277# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FLUTTER INSTABILITIES IN AN ANNULAR CASCADE WITH SUPERSONIC RELATIVE FLOW
Pierre Salauen 1979 32 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-610)
(ONERA-NT-1979-3; ISSN-0078-379) Avail: NTIS HC A03/MF A01

A linearized three dimensional theory of the flow around a circular cascade of helical blades placed between two concentric cylinders was investigated. The relative flow was supersonic over the whole blade length, but the axial flow was subsonic. The influence of stagger angle, frequency, Mach number and number of blades on the stability of the first bending mode and the first torsion mode was studied. The first bending mode was always stable; the first torsion mode was usually unstable, but flutter was suppressed by reducing the number of blades, at least in the example considered. Author (ESA)

N80-22278# Engineering Sciences Data Unit, London (England).
A COMPARISON OF VARIOUS NUMERICAL METHODS FOR CALCULATING SUPERCRITICAL INVISCID ISENTROPIC FLOW OVER TWO-DIMENSIONAL AEROFOILS
R. H. Blockley Orpington, England Defense Res. Inform. Centre 1979 150 p refs
(Contract K/A72c/259/CB/A72c)
(S/T-Memo-4/75; BR47382) Avail: NTIS HC A07/MF A01

Numerical solutions of full potential flow equations are mutually compared with particular reference to the method of Garabedian and Korn. Comparisons of pressure distributions and aerodynamic force and moment coefficients for a small range of airfoils at Mach numbers for near-critical or supercritical flow are presented. Procedures for using the Garabedian and Korn program are recommended. An approximate method (transonic small perturbation method based on Krupp and Murman) is similarly compared with that of Garabedian and Korn. The airfoils studied are described. Author (ESA)

N80-22279# Royal Aircraft Establishment, Farnborough (England).
THREE-DIMENSIONAL VISCOUS AND INVISCID SEPARATION OF A VORTEX SHEET FROM A SMOOTH NON-SLENDER BODY
F. T. Smith (Imperial Coll. of Science and Technology) London HMSO Aug. 1978 40 p refs
(RAE-TM-Aero-3436; RAE-TR-78095; BR65538) Avail: NTIS HC A03/MF A01

The local behavior of a vortex sheet near its (smoothly curved) line of separation from a smooth surface is examined from both the inviscid and viscous aspects, as well as for the general three-dimensional case. The inviscid behavior is first found for a special case, followed by the general inviscid case. The main inviscid requirement is that locally the normal distance of the vortex sheet from the surface must be proportional to the nth power of its normal distance from the separation line, where n can take the values 3/2, 5/2, 7/2, etc. The viscous (triple deck) account the three dimensional incompressible separation then singles out the value n = 3/2 as being the only consistent value, but with the coefficient of proportionality above being dependent on the Reynolds number. An appendix considers further local flow properties beneath the vortex sheet are considered, raising the possibility of a second viscous separation near the main separation line. Author (ESA)

N80-22280# Royal Aircraft Establishment, Farnborough (England).
A COMMENT ON THE ORIGIN OF ENDWALL INTERFERENCE IN WIND TUNNEL TESTS OF AEROFOILS
K. G. Winter and J. H. B. Smith London HMSO 20 Aug. 1979 20 p refs
(RAE-TM-Aero-1816; BR70172) Avail: NTIS HC A02/MF A01

The interference effects of an airfoil spanning the working section of a wind tunnel due to the presence of boundary layers on the walls are discussed. Tests reveal behavior different from that predicted by theory. A qualitative assessment of the problem is made and it is suggested that the interference be explained in terms of changes in the displacement thickness of the boundary layers on the tunnel walls rather than in terms of induced effects from trailing vorticity. Author (ESA)

N80-22281# Royal Aircraft Establishment, Farnborough (England).
AERODYNAMIC CHARACTERISTICS OF MOVING TRAILING-EDGE CONTROLS AT SUBSONIC AND TRANSONIC SPEEDS
D. G. Mabey, D. M. McOwat, and B. L. Welsh London HMSO 25 Jun. 1979 27 p refs Presented at AGARD Fluid Dyn. Panel Meeting on the Aerodyn. Characteristics of Controls, May 1979
(RAE-TM-Struc-947; BR69932) Avail: NTIS HC A03/MF A01

Oscillatory pressures calculated and measured at high subsonic speeds for a swept back wing of aspect ratio 6 with a part span trailing-edge flap are compared. The flap was driven at frequencies of 1 Hz (quasi-steady) and 90 Hz at Mach numbers from 0.40 to 0.95 with both fixed and free transition over a range of Reynolds numbers from one to four million. The measured oscillatory pressures which depend strongly on the boundary layer displacement thickness at the hinge line, are presented. Tests with the flaps driven simultaneously at two frequencies (90 Hz and 131 Hz) at subsonic and transonic speeds are discussed. Author (ESA)

N80-22282# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
MEASUREMENT OF LOCAL SKIN FRICTION AND STATIC PRESSURE ON A SWEPT WING IN FLIGHT Final Report
A. Bertelrud Jul. 1979 77 p refs Prepared in cooperation with Swedish Air Force, Stockholm
(Contracts FMV-F-K-82223-76-001-21-001;
FMV-F-K-82223-77-001-21-001;
FMV-F-K-82223-77-116-21-001;
FMV-F-K-82223-78-003-21-001)
(FFA-AU-1370) Avail: NTIS HC A05/MF A01

A series of flight tests have been performed to explore the possibility of using multiple total head/static probes (modified Preston tubes) for the measurement of local skin friction and static pressure distribution in flight. The aircraft used in the experiment was a SAAB 32 A Lansen, which is a swept wing attack fighter. It is shown that the results obtained are reproducible and agree reasonably well with computations. Thin films

(McCroskey gauges) mounted on the leading edge showed no deviations in resistance after 19 flights. This indicates that the gauges can be used for qualitative, and probably also quantitative measurements in flight. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N80-22283*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESOURCE MANAGEMENT ON THE FLIGHT DECK
George E. Cooper, ed., Maurice D. White, ed. (Cooper (George E.), Saratoga, Calif.), and John K. Lauber, ed. Mar. 1980 247 p ref Proceedings of a NASA/Industry Workshop, San Francisco, 26-28 Jun. 1979
(NASA-CP-2120) Avail: NTIS HC A11/MF A01 CSCL 05J

Several approaches to the training and selection of aircrew are presented including both industry and nonindustry perspectives. Human factor aspects of the problem are also examined with specific emphasis on the psychology of the flight deck situation. For individual titles, see N80-22284 through N80-22292.

N80-22284*# Texas Univ. at Austin.
SOCIAL PSYCHOLOGY ON THE FLIGHT DECK
Robert L. Helmreich *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 17-30 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05J

Social psychological and personality factors that can influence resource management on the flight deck are discussed. It is argued that personality and situational factors intersect to determine crew responses and that assessment of performance under full crew and mission conditions can provide the most valuable information about relevant factors. The possibility of training procedures to improve performance on these dimensions is discussed. Author

N80-22285*# Harvard Univ., Cambridge, Mass. Graduate School of Education.
AVIATION ACCIDENTS AND THE THEORY OF THE SITUATION
Lee Bolman *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 31-58 refs (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05J

Social-psychological factors effecting the performance of flight crews are examined. In particular, a crew member's perceptual-psychological constructs of the flight situation (theories of the situation) are discussed. The skills and willingness of a flight crew to be alert to possible errors in the theory become critical to their effectiveness and their ability to ensure a safe flight. Several major factors that determine the likelihood that a faulty theory will be detected and revised are identified. M.G.

N80-22286*# United Air Lines, Inc., Denver, Colo.
FLIGHT SELECTION AT UNITED AIRLINES
William Traub *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 61-75 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

Airline pilot selection proceedures are discussed including psychogical and personality tests, psychomotor performance requirements, and flight skills evaluation. Necessary attitude and personality traits are described and an outline of computer selection, testing, and training techniques is given. M.G.

N80-22287*# British Airways, Middlesex (England).
BRITISH AIRWAYS' PRE-COMMAND TRAINING PROGRAM
L. F. J. Holdstock *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 76-86 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

Classroom, flight simulator, and in-flight sessions of an airline pilot training program are briefly described. Factors discussed include initial command potential assessment, precommand airline management studies course, precommand course, and command course. M.G.

N80-22288*# American Airlines, Inc., Ft. Worth, Tex.
UPGRADE AND INTERPERSONAL SKILLS TRAINING AT AMERICAN AIRLINES
W. W. Estridge and J. L. Mansfield *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 87-96 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

Segments of the interpersonal skills training audio visual program are presented. The program was developed to train customer contact personnel with specific emphasis on transactional analysis in customer treatment. Concepts of transactional analysis are summarized in terms of the make up of the personality, identified as the three ego states. These ego states are identified as the parent, the adult, and the child. Synopses of four of the tape programs are given. R.C.T.

N80-22289*# Swissair, Zurich (Switzerland).
CAPTAINS' TRAINING AT SWISSAIR
N. Grob *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 97-106 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

The objectives, crucial points, and problems of the individual phase of the captain's basic training are examined. The prerequisites to pilot selection are given as well as a generalized outline of pilot career progression. R.C.T.

N80-22290*# Eastern Air Lines, Inc., Miami, Fla.
LINE-ORIENTED FLIGHT TRAINING
Berton E. Beach *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 107-118 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

Some of the concepts related to a line-oriented flight training program are discussed. The need to shift from training in manipulative skills to something closer to management skills is emphasized. The program is evaluated in terms of its realistic approaches which include the simulator's optimized motion and visual capabilities. The value of standard operating procedures as they affect the line pilot in everyday operations are also illustrated. R.C.T.

N80-22291*# United Air Lines, Inc., Denver, Colo.
FLIGHT MANAGER AND CHECK-AIRMAN TRAINING
J. E. Carroll *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 119-132 (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05I

An analysis of industry incidents, accidents, and related human factors research is given. The need to develop more effective resource management training for the flight deck crewmembers is discussed with specific emphasis on flight manager and check-airman training. R.C.T.

N80-22292*# North Central Airlines, Inc., Minneapolis, Minn.
LEFT SEAT COMMAND OR LEADERSHIP FLIGHT, LEADERSHIP TRAINING AND RESEARCH AT NORTH CENTRAL AIRLINES
Gramer C Foster and Michael C. Garvey (Garvey (M. C.) and Associates, Inc.) *In* NASA. Ames Res. Center Resource Management on the Flight Deck Mar. 1980 p 133-146 refs (For primary document see N80-22283 13-03)
Avail: NTIS HC A11/MF A01 CSCL 05J

The need for flight leadership training for flight deck crewmembers is addressed. A management grid is also described which provides a quantitative management language against which any number of management behaviors can be measured. R.C.T.

N80-22293# Army Safety Center, Fort Rucker, Ala.
PROJECTED ACCIDENT COSTS FOR THE ADVANCED SCOUT HELICOPTER
James E. Jenks, Jr. and James E. Hicks Oct. 1979 24 p refs
(AD-A080109; USASC-TR-80-1) Avail: NTIS HC A02/MF A01 CSCL 01/2

This is the report of an analysis of the economic benefits of providing crashworthiness and other safety-related design improvements within future Army scout helicopters. The analysis was performed for use by the Advanced Scout Helicopter Project Manager (PM-ASH). The analysis baseline was all OH-58A major and minor aircraft accidents from January 1972 through December 1978. Projections are made for 11 candidate aircraft designs which may have potential use in the scout helicopter role as defined by PM-ASH. Accident rates and losses are derived for each candidate aircraft. Losses are projected for a 20-year period of peacetime operation. Projections are derived based on each candidate's design features and the effectiveness of these features under the particular conditions in each OH-58A accident. Recommendations are made regarding use of this data in an ASH development program. GRA

N80-22294# Army Safety Center, Fort Rucker, Ala.
SURVEY OF FORCED AND PRECAUTIONARY LANDING COSTS
Emil Spezia, G. D. Kimel, and Thomas Neese Jul. 1979 24 p
(AD-A080110; USASC-TR-79-4) Avail: NTIS HC A02/MF A01 CSCL 01/2

A questionnaire survey was conducted to learn the costs of forced landings (F/Ls) and precautionary landings (P/Ls). The questionnaire elicited cost data in respect to (1) the effect each mishap had on the mission assigned the mishap aircraft; (2) man-hours lost by the crew and passengers; (3) man-hours required to recover the crew, passengers, and aircraft; (4) time the mishap aircraft was unavailable for flight; (5) man-hours required to make the aircraft flyable; and (6) the components that malfunctioned to cause these mishaps. The broad and obscure costs revealed by the survey are sufficient to justify the initiation of a concerted effort to prevent the causes of these mishaps. Prevention of the causes of these mishaps will allow aviation units to operate more efficiently, i.e., allow them to maintain a higher state of combat readiness. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also 17 Spacecraft Communications, Command, and Tracking and 32 Communications.

N80-22295 Dayton Univ., Ohio.
OPTIMAL ESTIMATION APPLIED TO REDUNDANT STRAPPED DOWN INERTIAL SENSORS FOR NAVIGATION AND FLIGHT CONTROL Ph.D. Thesis
Jackie Wayne Bell 1979 213 p
Avail: Univ. Microfilms Order No. 8008430

The capability of various algorithms for improved estimation of the sensor true outputs from a strapped down inertial reference assembly is examined. A secondary factor is the optimum combination of the estimated outputs from a set of redundant inertial sensors to form an orthogonal triad inertial reference. The algorithms are based upon various levels of sensor modeling in Kalman or fixed-gain optimal filters. The algorithms range from a second-order to a fourth-order filter for each sensor. The redundant sensor estimated outputs are combined through a weighted least squares estimator which provides a statistical average of the estimated sensor outputs transformed into body coordinates. Dissert. Abstr.

N80-22296*# Texas Univ. at Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
A STUDY OF AUTONOMOUS SATELLITE NAVIGATION METHODS USING THE GLOBAL POSITIONING SATELLITE SYSTEM Final Report
Byron D. Tapley 20 Apr. 1980 55 p refs
(Grant NsG-5154)
(NASA-CR-162635) Avail: NTIS HC A04/MF A01 CSCL 17G

Special orbit determination algorithms were developed to accomodate the size and speed limitations of on-board computer systems of the NAVSTAR Global Positioning System. The algorithms use square root sequential filtering methods. A new method for the time update of the square root covariance matrix was also developed. In addition, the time update method was compared with another square root convariance propagation method to determine relative performance characteristics. Comparisions were based on the results of computer simulations of the LANDSAT-D satellite processing pseudo range and pseudo range-rate measurements from the phase one GPS. A summary of the comparison results is presented. R.E.S.

N80-22297*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NEW ALGORITHM FOR HORIZONTAL CAPTURE TRAJECTORIES
John D. McLean Mar. 1980 21 p refs
(NASA-TM-81186; A-8111) Avail: NTIS HC A02/MF A01 CSCL 17G

An algorithm which transfers an aircraft from an initial position and heading to a final position and heading was developed for onboard synthesis of horizontal flight paths. The algorithm finds all solutions possible, and selects the one with minimum path length. Degenerate conditions in which one or more of the basic segments is missing are handled without difficulty. The solution to this problem is derived, and a FORTRAN listing of the algorithm is provided. E.D.K.

N80-22298# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
THE STOCHASTIC ANALYSIS OF DYNAMIC SYSTEMS MOVING THROUGH RANDOM FIELDS Interim Report
A. S. Willsky and N. R. Sandell Nov. 1979 49 p refs Prepared in cooperation with Analytic Sciences Corp., Reading, Mass.
(Contract N00014-76-C-0346; Grant AF-AFOSR-3281-77; AF Proj. 2304)
(AD-A080204; LIDS-R-958; AFOSR-80-0018TR) Avail: NTIS HC A03/MF A01 CSCL 17/7

This paper considers dynamic systems that move along specified trajectories across random fields, where the field acts as a driving force to the dynamic system. For a specific class of random fields equations were developed for the evolution of the covariance of the state of the dynamic system, and in the special case in which the trajectory is a straight line path followed by a 180 1/4 turn (i.e., an 'over and back' trajectory) a Markovian model that involves a change in the dimension of the state after the turn were developed. For this case this report also discusses the estimation problem using recently developed results on 'real-time smoothing'. GRA

N80-22299# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
GRAVITY MODEL EVALUATION FOR PRECISE TERRESTRIAL INERTIAL NAVIGATION. A SYSTEM ACCURACY APPROACH Ph.D. Thesis
Robert Miles Edwards Dec. 1979 280 p refs
(AD-A080170; AFIT/DS/EE/79-1) Avail: NTIS HC A13/MF A01 CSCL 17/7

Inertial navigation has evolved to the point that the traditional gravity model is a principle error source in precise systems. Since future systems may require a more accurate gravity model, a statistical performance evaluation is needed to compare candidate models on realistic scenarios. The present methods of model evaluation are Monte Carlo, which is computationally costly, and linear state space covariance analysis, which has troublesome trajectory and statistical model restrictions. This research developed a new statistical analysis technique based on a double integral expression of the navigation system error covariance. Numerical algorithms were formulated to approximate the covariance, and the accuracy and efficiency of these algorithms

were compared using a simple Schuler Loop example analysis. An algorithm based on a pair of nested, single integrals (Nested Integrals) was shown to be more efficient than direct approximation of the covariance double integral and was selected for further development. This Nested Integrals method was verified against linear state space covariance analysis results on a great circle trajectory and against Monte Carlo results on a hypothetical trajectory for an air-launched strategic missile. GRA

N80-22300# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DETERMINISTIC ANALYSIS OF THE EFFECTS OF SENSOR ERRORS ON STRAPPED-DOWN INS PERFORMANCE M.S. Thesis
Richard H. Reynolds 3 Dec. 1979 171 p refs
(AD-A080373; AFIT/GE/EE/79-30) Avail: NTIS HC A08/MF A01 CSCL 17/7

The operation of a strapped-down inertial navigation system in a high dynamic environment was simulated. Its performance was assessed using a laser gyro and a quartz-flexure accelerometer as the sensors. Using deterministic values for the sensor errors, the effects of the sensor errors on the INS performance was assessed. Emphasis is placed on the effects that the sensor errors have on the INS errors in a high dynamic environment. Structural mode effects on INS performance are also evaluated. Following this an analysis of the sensitivity of the INS errors in position and velocity to each inertial sensor is determined. GRA

N80-22301# Texas Instruments, Inc., Dallas. Equipment Group.
GLOBAL POSITIONING SYSTEMS (GPS). HIGH DYNAMIC USER EQUIPMENT (HDUE), VOLUME 1 Final Report, Jun. 1975 - Aug. 1979
10 Aug. 1979 30 p 3 Vol.
(Contract F04701-75-C-0180)
(AD-A076479; SAMSO-SD-TR-79-12-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 17/7

This HDUE Final Report has documented the technology, both hardware and software, and the philosophy that Texas Instruments implemented in their High Dynamic User Equipment for the GPS concept validation phase. The overall set as well as its individual modules has been explained. Texas Instruments HDUE concepts, techniques, and results of design-to-cost, producibility, reliability, and maintainability are reported. GRA

N80-22302# Naval Postgraduate School, Monterey, Calif.
SATELLITE NAVIGATION IN THE US COAST GUARD M.S. Thesis
Richard Sheridan Hartman, Jr. Sep. 1979 126 p refs
(AD-A081059) Avail: NTIS HC A07/MF A01 CSCL 17/7

This thesis investigates many of the issues surrounding the civil maritime navigation dilemma facing the USCG. At present, LORAN-C and OMEGA, which are hyperbolic radionavigation systems and TRANSIT, a Doppler shift satellite-based system, are the main systems employed in the civil maritime field. NAVSTAR GPS, a passive ranging satellite navigation system is, in the meantime, showing great promise as the replacement system for primary radionavigation in the U.S. There are several key questions, one involving national security, which must be answered, however, before NAVSTAR becomes operational. What positional accuracy will be made available to the civil community; What are the economics of the user equipments; Will NAVSTAR be accepted as a successful replacement for LORAN by the civil community. To aid in answering some of these questions, the results of an informal survey of the civil maritime industry are presented. The final outcome remains to be seen. These issues will require careful thought by this country's top leaders before any final committment to NAVSTAR can be made or prior to any decision to discontinue LORAN-C or OMEGA. GRA

N80-22303# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
COMPARISON OF THE MINILIR LOCATION SYSTEM AND THE NLR INERTIA MEASURING SYSTEM STALINS
A. J. L. Willekens 28 Jun. 1978 17 p
(NLR-MP-78026-U) Avail: NTIS HC A02/MF A01

Aircraft trajectories were determined using the optical location system (MINILIR) and the inertial measuring system (STALINS). The optical tracking was controlled with a movie camera mounted on the MINILIR tracker. A known position in flight was obtained with a high precision fan marker system RASP. The accuracy of the position and velocity data obtained using both systems is discussed. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-22304*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRELIMINARY INVESTIGATION OF MOTION REQUIREMENTS FOR THE SIMULATION OF HELICOPTER HOVER TASKS
Russell V. Parrish Apr. 1980 31 p refs
(NASA-TM-81801) Avail: NTIS HC A03/MF A01 CSCL 01C

Data from a preliminary experiment are presented which attempted to define a helicopter hover task that would allow the detection of objectively-measured differences in fixed base/moving base simulator performance. The addition of heave, pitch, and roll movement of a ship at sea to the hover task, by means of an adaption of a simulator g-seat, potentially fulfills the desired definition. The feasibility of g-seat substitution for platform motion can be investigated utilizing this task.Author

N80-22305*# Science Applications, Inc., Los Angeles, Calif. Economic Analysis Div.
PARAMETRIC STUDY OF HELICOPTER AIRCRAFT SYSTEMS COSTS AND WEIGHTS
Michael N. Beltramo Jan. 1980 179 p refs
(Contract NAS2-8703)
(NASA-CR-152315) Avail: NTIS HC A09/MF A01 CSCL 01C

Weight estimating relationships (WERs) and recurring production cost estimating relationships (CERs) were developed for helicopters at the system level. The WERs estimate system level weight based on performance or design characteristics which are available during concept formulation or the preliminary design phase. The CER (or CERs in some cases) for each system utilize weight (either actual or estimated using the appropriate WER) and production quantity as the key parameters. R.E.S.

N80-22306*# National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMICS OF THE NEW GENERATION OF COMBAT AIRCRAFT WITH DELTA WINGS
M. P. Bohn Mar. 1980 26 p Transl. into ENGLISH of "Aerodynamique de la Nouvelle Generation d'Avions de Combat a Aile Delta", Rept. AGARD-CP-241 AGARD, Paris, Jun. 1978 p 11-1-11-13 Presented at the Multi-Panel Symp. on Fighter Aircraft Design, Florence, 3-6 Oct. 1977 Translation was announced as N78-30106 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75793; AGARD-CP-241) Avail: NTIS HC A03/MF A01 CSCL 01C

The use of delta wing aerodynamic design for modern fighter aircraft is discussed. Various current French fighter airplanes are utilized for comparisons. E.D.K.

N80-22307# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYTICAL AND EXPERIMENTAL STUDY OF AIRCRAFT HYDRAULIC LINES INCLUDING THE EFFECT OF MEAN FLOW Ph.D. Thesis
John H. Pletcher, Jr. May 1979 95 p refs
(AF Proj. 3145)
(AD-A080153; AFIT/DS/AA/79S-1) Avail: NTIS HC A05/MF A01 CSCL 01/3

A mathematical model of a fluid transmission line was developed which included the effect of mean flow coupling with oscillatory flow. The analysis centered on solving the nonhomogeneous confluent hypergeometric equation with complex parameters using an infinite series and evaluating the solution using Ward's method. Experiments were run using an aircraft hydraulic system. The frequency response, vibration displacement, and standing pressure half wave were measured in a straight line and a line with bends for flow rates up to 9.5 gpm. A clamp-on transducer, which did not disturb the flow and could be easily moved, was used for the pressure measurements. In the absence of vibration the clamp-on transducer measurements were within 5% of readings taken with a conventional Statham in-line transducer. A sensitivity analysis showed the effect of small changes in geometry, temperature, steady-state pressure, fluid properties, entrained air content, and element volume. Using the new mathematical model, the attenuation and phase constant were calculated for hydraulic and air lines. Results compared well with experiment and published data. The new analysis and line mode provide a means for the fluid systems engineer to accurately account for mean flow effects. GRA

N80-22308# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT Semiannual Summary Report, 1 Jan. 1962 - 30 Jun. 1979
Warren J. Williams 1 Nov. 1979 159 p refs Revised
(AD-A080580; NADC-13920-2) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report is a specialized summary of normal acceleration data recorded by counting accelerometers. Data are separated by calendar time and mission category. Only data reported in the counting accelerometer program are included. This is a semi-annual progress report, and it presents a specialized summary of the data in the counting accelerometer program. Statistics describing Navy and Marine aircraft cumulative g-count exceedances are calculated and tabulated. These tabulations are separated by calendar time and into four major categories of fleet experience: Navy Training, Navy Combat, Marine Training, and Marine Combat. These data show that the load rate distributions (counts at 1000 hours) for most models and most g-levels have a non-normal distribution. Within a model (F-4N, F-8J, etc.) differences in the average load rates exist when data are separated by calendar time or mission category. GRA

N80-22309# Aeronautical Research Labs., Melbourne (Australia).
GENERATION OF A REPRESENTATIVE LOAD SEQUENCE FOR THE FATIGUE TESTING OF MACCHI MB 326H SPAR BOOMS
L. R. Gratzer Jan. 1979 26 p refs
(AD-A074155; ARL/Struc-Note-450) Avail: NTIS HC A03/MF A01 CSCL 01/3

Testing techniques have been developed to allow more realistic load sequences. To take advantage of this, the design of such test sequences must also be improved and for several years large scale tests at ARL have relied on loads obtained from flight histories transformed as little as possible. In this way the probability structure of flight sequences can be restored. Until now however, the design of test histories has been almost entirely manual. This note describes the generation of histories by use of automatic data processing techniques and linear programming. The example used in this note is the Macchi center section spar boom which is being tested under the design load history to supplement earlier data obtained under less realistic load sequences. GRA

N80-22310# Textron Bell Helicopter, Fort Worth, Tex.
IMPROVED MANEUVER CRITERIA EVALUATION PROGRAM Final report, Sep. 1976 - Jul 1979
T. Wood and T. Wask Nov. 1979 79 p refs
(Contract DAAJ02-76-C-0064; DA Proj. 1F2-63211-D-157)
(AD-A080408; USARTL-TR-79-20) Avail: NTIS HC A05/MF A01 CSCL 01/2

The Maneuver Criteria Evaluation Program (MCEP) is a digital computer program that solves the flight path equation of motion for a helicopter without auxiliary propulsion. The use of basic work, energy, and power relationships makes possible accurate representation of flight path trajectories. MCEP can be used to aid in the development of maneuver requirements that provide the necessary maneuver capability to perform the desired mission. The desired mission is simulated in MCEP by using individual flight controllers to 'fly' the helicopter through the mission profile. Key maneuver parameters are monitored throughout the flight profile to provide insight into the performance of the helicopter in achieving the desired flight trajectory. Three maneuvers have been modified to allow rotor rpm to be bled to use some of the rotor's stored energy. These maneuvers are a constant altitude acceleration maneuver, a collective pop-up maneuver, and a sideward acceleration maneuver. Correlation with flight test data is established to validate the bleed rpm maneuvers. The appendix to the report, the User's Guide, contains the detailed information necessary for setting up an input data deck for MCEP. GRA

N80-22311# Textron Bell Helicopter, Fort Worth, Tex.
AH-1S HIGH-SURVIVABLE TRANSMISSION SYSTEM Final Report, Oct. 1977 - Dec. 1978
Gary A. Cope Oct. 1979 89 p ref
(Contract DAAJ02-76-C-0006; DA Proj. 1F2-63208-DB-52)
(AD-A080568; USAAVRADCOM-TR-79-43) Avail: NTIS HC A05/MF A01 CSCL 01/3

The objective of the work performed on this program was to demonstrate that the AH-1S main transmission system, modified with internal component improvements but without an emergency lubrication system, could operate for 30 minutes following the loss of lubrication. The internal component improvements were based upon work done under this program and work done under a previous Eustis Directorate contract, both conducted by Bell Helicopter Textron. Six different modified versions of the AH-1S transmission configuration were tested under this program. Four of the six transmission configurations had been run to failure previously and the results reported in USAAMRDL-TR-77-30. The loss-of-lube testing for the final two transmission configurations was conducted at 680 input horsepower (60 percent of maximum continuous power rating of the AH-1S) and 6600 input rpm. The first transmission configuration tested ran 25 minutes under loss-of-lube conditions before failure of the lower planetary stage. The second transmission configuration ran 54 minutes before failure of the lower planetary stage. Thus, the 30-minute loss-of-lube capability has been demonstrated for all transmission components. GRA

N80-22312# Textron Bell Helicopter, Fort Worth, Tex.
ROTORCRAFT FLIGHT SIMULATION, COMPUTER PROGRAM C81. VOLUME 1: ENGINEER'S MANUAL Final Report, Nov. 1976 - Aug. 1977
James R. VanGaasbeek, T. T. McLarty, and S. G. Sadler Oct. 1979 394 p refs Supersedes USAAMRDL-TR-76-41A 3 Vol.
(Contract DAAJ02-77-C-0003; DA Proj. 1L2-62209-AH-76)
(AD-A079631; BHT-699-099-062-Vol-1; USARTL-TR-77-54A; USSAMRDL-TR-76-41A) Avail: NTIS HC A17/MF A01 CSCL 01/3

This report consists of three volumes and documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAJ77. The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAMO5, and the rotor wake program is called AR9102. The first volume, the Engineer's Manual, presents an overview of the computer program capabilities plus discussions for the background and development of the principal mathematical models in the program. The models discussed include all those currently in the program. GRA

N80-22313# Textron Bell Helicopter, Fort Worth, Tex.
ROTORCRAFT FLIGHT SIMULATION, COMPUTER PROGRAM C81. VOLUME 2: USER'S MANUAL Final Report, Nov. 1976 - Aug. 1977
James R. VanGaasbeek Oct. 1979 511 p refs 3 Vol.
(Contract DAAJ02-77-C-0003; DA Proj. 1L2-62209-AH-76)
(AD-A079632; BHT-699-099-062-Vol-2; USARTL-TR-77-54B; USAAMRDL-TR-76-41B) Avail: NTIS HC A22/MF A01 CSCL 01/3

This report consists of three volumes and documents the current version in the C81 family of rotorcraft flight simulation

programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAJ77. The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAMO5, and the rotor wake program is called AR9102. Volume 2, the User's Manual, contains the detailed information necessary for setting up an input data deck and interpreting the computed data. Volume 3, the Programmer's Manual, includes a catalog of subroutines and a discussion of programming considerations. The source tapes and related software for the computer programs documented in this report are unpublished data on file at the Applied Technology Laboratory, U.S. Army Research and Technology Laboratories (AVRADCOM), Fort Eustis, Virginia. GRA

N80-22314# Naval Ship Research and Development Center, Bethesda, Md.

THE EFFECT OF SHAFT ANGLE ON PERFORMANCE OF A CIRCULATION CONTROL HIGH-SPEED ROTOR AT AN ADVANCE RATIO OF 0.7

Kenneth R. Reader Feb. 1980 42 p refs

(AD-A080953; AERO-1262; DTNSRDC-80/015) Avail: NTIS HC A03/MF A01 CSCL 20/4

The performance of a high speed rotor model, designated the reverse blowing circulation control rotor (RBCCR), evaluated in a wind tunnel in the forward flight mode is discussed. The effects of rotor shaft angle of attack on rotor performance at the transition advance ratio of mu = 0.7 are specifically examined. The test variables include rotor thrust, blade collective pitch angle, tip Mach number, and rotor shaft angle. The RBCCR model demonstrates both the lift and trim capabilities required in the transitional flight regime. The model also shows that rotor efficiency and power sharing between shaft power and compressor power can be controlled by rotor shaft angle at an advance ratio of 0.7. M.G.

N80-22315# European Space Agency, Paris (France).

INVESTIGATIONS INTO AN ACTIVE VIBRATION ISOLATION SYSTEM FOR HELICOPTERS WITH RIGID AND ELASTIC AIRFRAME MODELING

Jean Skudridakis 1979 73 p refs Transl. into ENGLISH of "Untersichung zu Einen Aktiven Schwingungsisolstionssystem fuer Hubschrauber bei Starrer und Elastischer Zellenomodellierung", Rept. DLR-IB-552-78-6 DFVLR, Brunswick, Jun. 1978

(ESA-TT-531; DLR-IB-552/78-6) Avail: NTIS HC A04/MF A01

A system for active rotor isolation was investigated to compensate for blade number harmonic excitation of the rotor and limit the static relative movement of the rotor drive unit. Several sensor configurations were studied for the first completed regulator design of a single rigid function model with a modified Riccati design. This single axis computer model was reviewed and extended for the elastic helicopter airframe modeling (by means of a modified Riccati design). Computer results show that the active rotor isolation is superior in design to all known passive rotor isolation systems. The regulators designed for the single axis computer model show very good isolation of vibration at the 4- and 8- fold rotation frequencies of the rotor, in conjunction with rapid swinging. In addition, the separation between the rotor drive unit and the airframe was reduced with an additional load factor. Author (ESA)

N80-22316# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

A PRACTICAL METHOD FOR PREDICTING ROUGHNESS EFFECTS ON AIRCRAFT

A. Bertelrud Nov. 1978 54 p refs

(Contract SWEDBTD-71 348-U-253)

(FFA-AU-1413) Avail: NTIS HC A04/MF A01

A method for prediction of the extra drag due to surface roughness on aircraft is described. The method is based on use of a number of working charts for flow parameters and includes charts for the drag increments due to different types of roughness. In the introductory part, the flow around wings is described with emphasis on the variation of flow characteristics with flight conditions. Author (ESA)

N80-22317# European Space Agency, Paris (France).

CIVIL COMPONENT PROGRAM WING SECTION. PREDIMENSIONING OF A SUPERCRITICAL WING

Reinhard Arndt Jul. 1979 226 p refs Transl. into ENGLISH of "Ziviles Kommponentenprogramm 'Flugelsektion' - Vordimensionierung eines Flugels mit Ueberkritischem Profil", Rept. BMFT-FB-W-77-38 DFVLR, Cologne and MBR G.m.b.H., Hamburg, Nov. 1977 Original report in GERMAN previously announced as X79-72062

(ESA-TT-542; BMFT-FB-W-77-38) Avail: NTIS HC A11/MF A01; ZLDI, Munich DM 47,45

To achieve an optimal wing structure with respect to stringer and rib pitch and their cross-sectional shape, an estimated dimensioning of 700 mm rib pitch based upon the structure optimization program 'Dascha' for rigid load cases was written. The coordinates are calculates from the contour program 'Geolan', based on the wing profile MBB A1-725-146 and using the wing geometry of the ZKP basic design 3 (A 300 B 10 X-2). The dimensioning estimate was made in relation to rigid load cases. To obtain a minimum of structure, this estimation should be repeated with other pitches and cross-sectional shapes. The elastic load cases which result in greater sectional sizes can then be taken into consideration. Author (ESA)

N80-22318# Defence Research Information Centre, Orpington (England).

TRIALS TO COMPARE THE STOPPING PERFORMANCE OF THREE ANTI-SKID SYSTEMS AND TO DEMONSTRATE METHODS OF DETERMINING AIRCRAFT STOP DISTANCES ON THE STANDARD MILITARY REFERENCE WET SURFACE

I. Beaty (Mech. Eng. Res. and Develop.) and R. W. Sugg (Mech. Eng. Res. and Develop.) London HMSO Oct. 1979 64 p refs

(S/T-Memo-3/79; BR70264) Avail: NTIS HC A04/MF A01

Tests were conducted to determine if there was any difference in the stop distance of a BAC 1-11 aircraft under wet runway conditions when fitted with three different modern anti-skid systems. By comparing the aircraft stop distances at the mu-meter reading of .6 it was concluded that although the two more modern systems appeared to give the shorter distance, the difference was small and based on insufficient data points to give a high degree of confidence. The aircraft Braking Force Coefficient versus speed and mu-meter reading from one of the runs was used to demonstrate the use a method to determine the stop distance on the standard military reference wet surface at the weight at which the aircraft was tested. A method of deciding on the suitability of a test runway for aircraft/mu-meter braking trials using National and NATO standards are presented as well as recommendations on how to conduct the trials and how to determine mu-meter speed/friction curves for the test surface. Author (ESA)

N80-22319# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

IN-FLIGHT HANDLING QUALITIES INVESTIGATION OF AIRBUS A 310 DLC. CONFIGURATIONS ON LANDING APPROACH USING THE DFVLR-HFB 320 VARIABLE STABILITY AIRCRAFT

Dietrich Hanke Feb. 1979 87 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-630)

(DFVLR-FB-79-18) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 17,30

In-flight simulation of the longitudinal and lateral/directional dynamics of the Airbus A 310 aircraft using the DFVLR-HFB 320 variable stability aircraft was studied. The evaluation of different spoiler direct lift controls (DLC) concepts for longitudinal control was stressed. The influence of these concepts handling qualities and pilot-vehicle performance under real instrument landing systems (ILS) approach environmental conditions was determined. Sixty-three ILS approaches were flown by two pilots evaluating four aircraft/DLC configurations. The main handling quality parameter for DLC enhanced longitudinal control is the flight path to pitch attitude phase. A new general applicable flight path to pitch attitude phase criteria is proposed. Author (ESA)

N80-22320# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

ROUGHNESS EFFECTS ON FUEL CONSUMPTION FOR TWO COMMERCIAL AIRCRAFT: MCDONNELL DOUGLAS DC-9 AND DC-10 Final Report
A. Bertelrud Oct. 1979 48 p refs
(Contracts SWEDBTD-77-4869; SWEDBTD-78-5543)
(FFA-AU-1456) Avail: NTIS HC A03/MF A01

The effects of surface roughness on the fuel consumption of two typical passenger aircraft, McDonnell Douglas DC-9 and DC-10, are estimated. Typical cruise conditions and flights for the two aircraft types are considered. The roughness effects are estimated at two levels of sophistication; comprehensive and simplified. In the detailed approach the inviscid flow field around the wings is analyzed by means of a transonic, small perturbation code. The boundary layer is calculated with Bradshaw a straight-tapered swept wing code (with provision for distributed roughness). The simplified approach is basically a flat-plate analysis, which in many cases gave nearly the same results as the more sophisticated approach. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation and 35 Instrumentation and Photography*.

N80-22321*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PILOT ASSESSMENT OF TWO COMPUTER-GENERATED DISPLAY FORMATS FOR HELICOPTER INSTRUMENT APPROACH
Frank R. Niessen, Perry L. Deal, and James M. Patton, Jr. May 1980 40 p refs
(NASA-TM-80151; L-13136) Avail: NTIS HC A03/MF A01 CSCL 01D

Two computer generated display formats were evaluated as primary displays by six research pilots in a fixed base simulator. One of the computer generated display formats was an electronic attitude director indicator (EADI) which featured three cue flight director, command information, superimposed on true perspective runway symbology. The other computer generated display format featured separate horizontal and vertical situation information with vector predictors. A baseline display, consisting of an electromechanical attitude director indicator (ADI) with a three cue flight director and a moving map, was used as a reference for the pilot evaluations. Author

N80-22322# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN AND IMPLEMENTATION OF A MICROPROCESSOR FLIGHT DAMAGE MONITOR M.S. Thesis
Brian Charles Johnson Dec. 1979 190 p refs
(AD-A080417; AFIT/GCS/EE/79-6) Avail: NTIS HC A09/MF A01 CSCL 01/3

In order to design a constrained layer damping treatment for aircraft components, the Air Force Flight Dynamics Laboratory at Wright-Patterson Air Force Base, Ohio requires a knowledge of vibration and temperature variations which a component encounters during its life. This report discusses the design and implementation of a microprocessor based system to acquire vibration and temperature information, and computes the cumulative damage factor versus frequency and temperature in real time. The cumulative damage factor is computed for one of eight user selectable frequency ranges and for a temperature range of -50 to -225 and is stored in a non-volatile memory. The designed systems uses an LSI11 microcomputer systems consisting of an LSI-11 processor, an analog-to-digital converter, a real-time clock, PROM, a non-volatile memory, and a serial interface. The software developed for this system controls the data acquisition, the computation of a fast Fourier transform (FFT), the power spectrum of vibration data, and the subsequent computation of the cumulative damage factor. The data acquisition and FFT modules were coded in assembly language, and the other modulus were coded in FORTRAN. The output of the system consists of a table containing the cumulative damage as a function of frequency and temperature. A bench model system was constructed and tested, and a proposal for a flight-worthy system is made. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion*.

N80-22323*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
TWO-DIMENSIONAL FINITE-ELEMENT ANALYSES OF SIMULATED ROTOR-FRAGMENT IMPACTS AGAINST RINGS AND BEAMS COMPARED WITH EXPERIMENTS
Thomas R. Stagliano, Emmett A. Witmer, and Jose J. A. Rodal Dec. 1979 363 p refs
(Grant NGR-22-009-339)
(NASA-CR-159645; ASRL-TR-154-13) Avail: NTIS HC A16/MF A01 CSCL 21E

Finite element modeling alternatives as well as the utility and limitations of the two dimensional structural response computer code CIVM-JET 4B for predicting the transient, large deflection, elastic plastic, structural responses of two dimensional beam and/or ring structures which are subjected to rigid fragment impact were investigated. The applicability of the CIVM-JET 4B analysis and code for the prediction of steel containment ring response to impact by complex deformable fragments from a trihub burst of a T58 turbine rotor was studied. Dimensional analysis considerations were used in a parametric examination of data from engine rotor burst containment experiments and data from sphere beam impact experiments. The use of the CIVM-JET 4B computer code for making parametric structural response studies on both fragment-containment structure and fragment-deflector structure was illustrated. Modifications to the analysis/computation procedure were developed to alleviate restrictions. E.D.K.

N80-22324*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
PERFORMANCE DETERIORATION BASED ON EXISTING (HISTORICAL) DATA; JT9D JET ENGINE DIAGNOSTICS PROGRAM
G. Phil Sallee 20 Apr. 1978 228 p refs
(Contract NAS3-20632)
(NASA-CR-135448; PWA-5512-21) Avail: NTIS HC A11/MF A01 CSCL 21E

The results of the collection and analysis of historical data pertaining to the deterioration of JT9D engine performance are presented. The results of analyses of prerepair and postrepair engine test stand performance data from a number of airlines to establish the individual as well as average losses in engine performance with respect to service use are included. Analysis of the changes in mechanical condition of parts, obtained by inspection of used gas-path parts of varying age, allowed preliminary assessments of component performance deterioration levels and identification of the causitive factors. These component performance estimates, refined by data from special engine back-to-back testing related to module performance restoration, permitted the development of preliminary models of engine component/module performance deterioration with respect to usage. The preliminary assessment of the causes of module performance deterioration and the trends with usage are explained, along with the role each module plays in overall engine performance deterioration. Preliminary recommendations with respect to operating and maintenance practices which could be adopted to control the level of performance deterioration are presented. The needs for additional component sensitivity testing as well as outstanding issues are discussed. J.M.S.

N80-22325*# Solar Turbines International, San Diego, Calif.
ADVANCED CERAMIC MATERIAL FOR HIGH TEMPERA-

TURE TURBINE TIP SEALS Final Report, Feb. 1976 - May 1979
J. W. Vogan, N. G. Solomon, and A. R. Stetson Jan. 1980 97 p refs
(Contract NAS3-20081)
(NASA-CR-159774; SR79-R-4482-43; RDR-1831-43) Avail: NTIS HC A05/MF A01 CSCL 11A

Forty-one material systems were evaluated for potential use in turbine blade tip seal applications at 1370 C. Both ceramic blade tip inserts and abradable ceramic tip shoes were tested. Hot gas erosion, impact resistance, thermal stability, and dynamic rub performance were the criteria used in rating the various materials. Silicon carbide and silicon nitride were used, both as blade tips and abradables. The blade tip inserts were fabricated by hot pressing while low density and honeycomb abradables were sintered or reaction bonded. Author

N80-22326*# Teledyne Continental Motors, Muskegon, Mich.
DESIGN STUDY: A 186 kW LIGHTWEIGHT DIESEL AIRCRAFT ENGINE Final Report
Alex P. Brouwers Apr. 1980 24 p
(Contract NAS3-20830)
(NASA-CR-3261) Avail: NTIS HC A02/MF A01 CSCL 21E

The design of an aircraft engine capable of developing 186 kW shaft power at a 7620 m altitude is described. The 186 kW design takes into account expected new developments in aircraft designs resulting in a reassessment of the power requirements at the cruise mode operation. Based on the results of this analysis a three phase technology development program is projected resulting in production dates of 1985, 1992, and 2000. R.E.S.

N80-22327*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GENERAL AVIATION PROPULSION
Mar. 1980 437 p refs Conf. held in Cleveland, 28-29 Nov. 1979
(NASA-CP-2126; E-310) Avail: NTIS HC A19/MF A01 CSCL 21E

Programs exploring and demonstrating new technologies in general aviation propulsion are considered. These programs are the quiet, clean, general aviation turbofan (QCGAT) program; the general aviation turbine engine (GATE) study program; the general aviation propeller technology program; and the advanced rotary, diesel, and reciprocating engine programs. For individual titles, see N80-22328 through N80-22348.

N80-22328*# AiResearch Mfg. Co., Phoenix, Ariz.
AIRESEARCH QCGAT ENGINE, AIRPLANE, AND NACELLE DESIGN FEATURES
Roger W. Heldenbrand *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 11-43 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The quiet, clean, general aviation turbofan engine and nacelle system was designed and tested. The engine utilized the core of the AiResearch model TFE731-3 engine and incorporated several unique noise- and emissions-reduction features. Components that were successfully adapted to this core include the fan, gearbox, combustor, low-pressure turbine, and associated structure. A highly versatile workhorse nacelle incorporating interchangeable acoustic and hardwall duct liners, showed that large-engine attenuation technology could be applied to small propulsion engines. The application of the mixer compound nozzle demonstrated both performance and noise advantages on the engine. Major performance, emissions, and noise goals were demonstrated. A.R.H.

N80-22329*# AiResearch Mfg. Co., Phoenix, Ariz.
AIRESEARCH QCGAT ENGINE PERFORMANCE AND EMISSIONS TESTS
William M. Norgren *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 45-64 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

Results of aerodynamic performance and emission tests, conducted on a specially designed QCGAT engine in the 17,793-N (4,000 lb) thrust class, are presented. Performance of the AiResearch QCGAT engine was excellent throughout all testing. No serious mechanical malfunctions were encountered, and no significant test time was lost due to engine-related problems. Emissions were drastically reduced over similar engines, and the engine exhibited good smoke performance. A.R.H.

N80-22330*# AiResearch Mfg. Co., Phoenix, Ariz.
AIRESEARCH QCGAT ENGINE: ACOUSTIC TEST RESULTS
Larry S. Kisner *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 65-100 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The noise levels of the quiet, general aviation turbofan (QCGAT) engine were measured in ground static noise tests. The static noise levels were found to be markedly lower than the demonstrably quiet AiResearch model TFE731 engine. The measured QCGAT noise levels were correlated with analytical noise source predictions to derive free-field component noise predictions. These component noise sources were used to predict the QCGAT flyover noise levels at FAR Part 36 conditions. The predicted flyover noise levels are about 10 decibels lower than the current quietest business jets. Author

N80-22331*# Avco Lycoming Div., Stratford, Conn.
QCGAT AIRCRAFT/ENGINE DESIGN FOR REDUCED NOISE AND EMISSIONS
Leonard Lanson and Kenneth M. Terrill *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 101-133 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The high bypass ratio QCGAT engine played an important role in shaping the aircraft design. The aircraft which evolved is a sleek, advanced design, six-place aircraft with 3538 kg (7,800 lb) maximum gross weight. It offers a 2778 kilometer (1500 nautical mile) range with cruise speed of 0.5 Mach number and will take-off and land on the vast majority of general aviation airfields. Advanced features include broad application of composite materials and a supercritical wing design with winglets. Full-span fowler flaps were introduced to improve landing capability. Engines are fuselage-mounted with inlets over the wing to provide shielding of fan noise by the wing surfaces. The design objectives, noise, and emission considerations, engine cycle and engine description are discussed as well as specific design features. A.R.H.

N80-22332*# Avco Lycoming Div., Stratford, Conn.
AVCO LYCOMING QCGAT PROGRAM DESIGN CYCLE, DEMONSTRATED PERFORMANCE AND EMISSIONS
Phil Fogel and Angelo Koschier *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 135-154 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A high bypass ratio, twin spool turbofan engine of modular design which incorporates a front fan module driven by a modified LTS101 core engine was tested. The engine is housed in a nacelle incorporating full length fan ducting with sound treatment in both the inlet and fan discharge flow paths. Design goals of components and results of component tests are presented together with full engine test results. The rationale behind the combustor design selected for the engine is presented as well as the emissions test results. Total system (engine and nacelle) test results are included. A.R.H.

N80-22333*# Avco Lycoming Div., Stratford, Conn.
AVCO LYCOMING QUIET CLEAN GENERAL AVIATION TURBOFAN ENGINE
Craig A. Wilson *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 155-187 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A fan module was developed using an existing turboshaft engine. The fan was designed using the latest in large engine noise control technology. A mixer was added to reduce the already low exhaust gas velocity. A nacelle incorporating sound treatment was provided for the test engine. A noise prediction model was used through the design process to evaluate the various design alternatives. Acoustic tests were then made to

verify the prediction and identify the noise characteristics of the fan, core, jet, and sound treatment. Analysis of the recorded data yielded close agreement with the expected results. Core noise, as was expected, was the predominant source of noise for the quiet clean general aviation turbofan (QCGAT) engine. Flyover noise predictions were made which indicated that the Avco Lycoming QCGAT engine would meet the goals set for the QCGAT program. R.E.S.

N80-22334*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF NASA QCGAT PROGRAM
Gilbert K. Sievers *In its* Gen. Aviation Propulsion Mar. 1980 p 189-193 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The application of large turbofan engine technology to small general aviation turbofan engines to achieve low noise, low emissions, and acceptable fuel consumption is described. R.E.S.

N80-22335*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW OPPORTUNITIES FOR FUTURE, SMALL, GENERAL-AVIATION TURBINE ENGINES (GATE)
William C. Strack *In its* Gen. Aviation Propulsion Mar. 1980 p 195-219 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The results of four independent contracted studies to explore the opportunities for future small turbine engines are summarized in a composite overview. Candidate advanced technologies are screened, various cycles and staging arrangements are parametrically evaluated, and optimum conceptual engines are identified for a range of 300 to 600 horsepower applications. Engine improvements of 20 percent in specific fuel consumption and 40 percent in engine cost were forecast using high risk technologies that could be technically demonstrated by 1988. The ensuing economic benefits are in the neighborhood of 20 to 30 percent for twin-engine aircraft currently powered by piston engines. Author

N80-22336*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN OVERVIEW OF NASA RESEARCH ON POSITIVE DISPLACEMENT GENERAL-AVIATION ENGINES
Erwin E. Kempke, Jr. *In its* Gen. Aviation Propulsion Mar. 1980 p 227-229 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The research and technology program related to improved and advanced general aviation engines is described. Current research is directed at the near-term improvement of conventional air-cooled spark-ignition piston engines and at future alternative engine systems based on all-new spark-ignition piston engines, lightweight diesels, and rotary combustion engines that show potential for meeting program goals in the midterm and long-term future. The conventional piston engine activities involve efforts on applying existing technology to improve fuel economy, investigation of key processes to permit leaner operation and reduce drag, and the development of cost effective technology to permit flight at high-altitudes where fuel economy and safety are improved. The advanced engine concepts activities include engine conceptual design studies and enabling technology efforts on the critical or key technology items. R.E.S.

N80-22337*# Teledyne Continental Motors, Muskegon, Mich. Aircraft Products Div.
THE SPARK-IGNITION AIRCRAFT PISTON ENGINE OF THE FUTURE
Kenneth J. Stuckas *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 231-245 (For primary document see N80-22327 13-07)
(Contract NAS3-21272)
Avail: NTIS HC A19/MF A01 CSCL 21E

Areas of advanced technology appropriate to the design of a spark-ignition aircraft piston engine for the late 1980 time period were investigated and defined. Results of the study show that significant improvements in fuel economy, weight and size, safety, reliability, durability and performance may be achieved with a high degree of success, predicated on the continued development of advances in combustion systems, electronics, materials and control systems. R.E.S.

N80-22338*# Teledyne Continental Motors, Muskegon, Mich. General Products Div.
LIGHTWEIGHT DIESEL AIRCRAFT ENGINES FOR GENERAL AVIATION
Steven G. Berenyi and Alex P. Brouwers *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 247-285 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A methodical design study was conducted to arrive at new diesel engine configurations and applicable advanced technologies. Two engines are discussed and the description of each engine includes concept drawings. A performance analysis, stress and weight prediction, and a cost study were also conducted. This information was then applied to two airplane concepts, a six-place twin and a four-place single engine aircraft. The aircraft study consisted of installation drawings, computer generated performance data, aircraft operating costs and drawings of the resulting airplanes. The performance data shows a vast improvement over current gasoline-powered aircraft. At the completion of this basic study, the program was expanded to evaluate a third engine configuration. This third engine incorporates the best features of the original two, and its design is currently in progress. Preliminary information on this engine is presented. R.E.S.

N80-22339*# Curtiss-Wright Corp., Wood-Ridge, N.J.
ADVANCED ROTARY ENGINE STUDIES
Charles Jones *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 287-311 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A review of rotary engine developments relevant to a stratified charge rotary aircraft engine is presented. Advantages in module size and weight, fuel efficiency, reliability, and multi-fuel capability are discussed along with developments in turbocharging, increased mean effective pressure, improved apex seal/trochoid wear surfacing materials, and high strength and temperature aluminum casting alloys. A carbureted prototype aircraft engine is also described. M.G.

N80-22340*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POSITIVE DISPLACEMENT TYPE GENERAL-AVIATION ENGINES: SUMMARY AND CONCLUDING REMARKS
Erwin E. Kempke, Jr. *In its* Gen. Aviation Propulsion Mar. 1980 p 313-314 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The activities of programs investigating various aspects of aircraft internal combustion engines are briefly described including developments in fuel injection technology, cooling systems and drag reduction, turbocharger technology, and stratified-charge rotary engines. M.G.

N80-22341*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA PROPELLER TECHNOLOGY PROGRAM
Daniel C. Mikkelson *In its* Gen. Aviation Propulsion Mar. 1980 p 315-325 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A program on propeller technology applicable to both low and high speed general aviation aircraft is summarized, and the overall program objectives and approach are outlined. M.G.

N80-22342*# Cessna Aircraft Co., Wichita, Kans. Accessory Div.
LOW SPEED PROPELLERS: IMPACT OF ADVANCED TECHNOLOGIES
Ira D. Kelter *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 327-343 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

Sensitivity studies performed to evaluate the potential of several advanced technological elements on propeller performance, noise, weight, and cost for general aviation aircraft are discussed. Studies indicate that the application of advanced technologies to general aviation propellers can reduce fuel consumption in

future aircraft an average of ten percent, meeting current regulatory noise limits. Through the use of composite blade construction, up to 25 percent propeller weight reduction can be achieved. This weight reduction in addition to seven percent propeller efficiency improvements through application of advanced technologies result in four percent reduction in direct operating costs, ten percent reduction in aircraft acquisition cost, and seven percent lower gross weight for general aviation aircraft. M.G.

N80-22343*# Hamilton Standard, Windsor Locks, Conn.
ADVANCED TURBOPROP POTENTIAL FOR HIGH SPEED
Bernard S. Gatzen *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 345-359 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

A turboprop propulsion system for general aviation aircraft, allowing high speed flight (to 0.8 Mach) is discussed. Design methodologies for aerodynamic and acoustic considerations and the performance and cost advantages of a prop-fan aircraft are presented. M.G.

N80-22344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-SPEED-PROPELLER WIND-TUNNEL AEROACOUSTIC RESULTS
Robert J. Jeracki and James H. Dittmar *In its* Gen. Aviation Propulsion Mar. 1980 p 361-374 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

Some aerodynamic concepts are presented together with an explanation of how these concepts are applied to advanced propeller design. The unique features of this propulsion system are addressed with emphasis on the design concepts being considered for the high speed turboprop. More particular emphasis is given to the blade sweep, long blade chords, and the large number of blades. R.C.T.

N80-22345*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED PROPELLER AERODYNAMIC ANALYSIS
Lawrence J. Bober *In its* Gen. Aviation Propulsion Mar. 1980 p 375-385 refs (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The analytical approaches as well as the capabilities of three advanced analyses for predicting propeller aerodynamic performance are presented. It is shown that two of these analyses use a lifting line representation for the propeller blades, and the third uses a lifting surface representation. R.C.T.

N80-22346*# Ohio State Univ., Columbus. Aeronautical and Astronautical Research Lab.
PROPELLER AEROACOUSTIC METHODOLOGIES
Kenneth D. Korkan and Gerald M. Gregorek *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 387-404 refs (For primary document see N80-22327 13-07)
(Grant NsG-3247)
Avail: NTIS HC A19/MF A01 CSCL 21E

The aspects related to propeller performance by means of a review of propeller methodologies are addressed. Preliminary wind tunnel propeller performance data are presented and the predominent limitations of existing propeller performance methodologies are discussed. Airfoil developments appropriate for propeller applications are also reviewed. R.C.T.

N80-22347*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA PROPELLER NOISE RESEARCH
George C. Greene *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 405-420 (For primary document see N80-22327 13-07)
Avail: NTIS HC A19/MF A01 CSCL 21E

The research in propeller noise prediction, noise/performance optimization, and interior reduction is described. Selected results are presented to illustrate the status of the technology and the direction of future research. R.C.T.

N80-22348*# Pennsylvania State Univ., University Park.
PROPELLER DYNAMIC AND AEROELASTIC EFFECTS
Barnes W. McCormick *In* NASA. Lewis Res. Center Gen. Aviation Propulsion Mar. 1980 p 421-432 refs (For primary document see N80-22327 13-07)
(Grants NsG-1308; NsG-3304)
Avail: NTIS HC A19/MF A01 CSCL 21E

Various aspects of propeller blade dynamics are considered including those factors which are exciting the blades and the dynamic response of the blades to the excitations. Methods for treating this dynamic system are described and problems are discussed which may arise with advanced turboprop designs employing thin, swept blades. Author

N80-22349*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF THERMAL CYCLING ON ZrO2-Y2O3 THERMAL BARRIER COATINGS
G. McDonald and Robert C. Hendricks 1980 10 p refs Presented at the Intern. Conf. on Met. Coatings, San Diego, Calif., 21-25 Apr. 1980; sponsored by the Am. Vacuum Soc.
(NASA-TM-81480; E-416) Avail: NTIS HC A02/MF A01 CSCL 21E

A study was made of the comparative life of plasma sprayed ZrO2-Y2O3 thermal barrier coatings on NiCrAlY bond coats on Rene 41 in short (4 min) and long (57 min) thermal cycles to 1040 C in a 0.3 Mach flame. Short cycles greatly reduced the life of the ceramic coating in terms of time at temperature as compared to longer cycles. Appearance of the failed coating indicated compressive failure. Failure occurred at the bond coat-ceramic coat junction. At heating rates greater than 550 kw/sq m, the calculated coating detachment stress was in the range of literature values of coating adhesive/cohesive strength. Methods are discussed for decreasing the effect of high heating rate by avoiding compressive stress. Author

N80-22350*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY STUDY OF ADVANCED TURBOPROP AND TURBOSHAFT ENGINES FOR LIGHT AIRCRAFT
G. Knip, R. M. Plencner, and J. D. Eisenberg Apr. 1980 62 p refs
(NASA-TM-81467; E-397) Avail: NTIS HC A04/MF A01 CSCL 21E

The effects of engine configuration, advanced component technology, compressor pressure ratio and turbine rotor-inlet temperature on such figures of merit as vehicle gross weight, mission fuel, aircraft acquisition cost, operating, cost and life cycle cost are determined for three fixed- and two rotary-wing aircraft. Compared with a current production turboprop, an advanced technology (1988) engine results in a 23 percent decrease in specific fuel consumption. Depending on the figure of merit and the mission, turbine engine cost reductions required to achieve aircraft cost parity with a current spark ignition reciprocating (SIR) engine vary from 0 to 60 percent and from 6 to 74 percent with a hypothetical advanced SIR engine. Compared with a hypothetical turboshaft using currently available technology (1978), an advanced technology (1988) engine installed in a light twin-engine helicopter results in a 16 percent reduction in mission fuel and about 11 percent in most of the other figures of merit. A.R.H.

N80-22351# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.
INVESTIGATION OF LUBRICANT CONCEPTS APPLICABLE TO FUTURE NAVY AIRCRAFT PROPULSION SYSTEMS Final Report
A. J. Porazio, E. F. Pierce, and P. A. Karpovich Nov. 1979 51 p refs
(ZF54594001; WF54543300)
(AD-A079410; NAPC-PE-29) Avail: NTIS HC A04/MF A01 CSCL 11/8

Future lubrication requirements for Navy aircraft engines were estimated. Viable areas were evaluated to determine relative strengths and weaknesses of several systems. Among those areas investigated were ester lubricants, inserted ester lubricant systems, polyphenyl ethers and gas lubricated compliant bearings. GRA

N80-22352# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
THERMAL RESPONSE TURBINE SHROUD STUDY Final Report, Aug. 1978 - May 1979
E. J. Kawecki Wright-Patterson AFB, Ohio AFAPL Jul. 1979 135 p
(Contract F33615-78-C-2022; AF Proj. 3066)
(AD-A080620; PWA-FR-11867; AFAPL-TR-79-2087) Avail: NTIS HC A07/MF A01 CSCL 21/5

The program objective was to evaluate active clearance controls (ACC) for future military fighter and transport aircraft/engines, rank the candidate schemes, and recommend a future course of action. Fifty-one potential ACC concepts were reduced to twelve: five mechanical, two pneumatic, and five thermal. The fighter and transport missions selected were the Advanced Tactical Fighter (ATF), and the C141X strategic aircraft. Three levels of controls for ACC were considered: simple on/off two-position; open loop infinitely variable; and feedback (requiring a clearance sensor). On/off systems were selected for study because the majority of the benefit is obtained during cruise/dash and the open and feedback systems have positioning and reliability uncertainties. The criteria selected to evaluate the different schemes were net Life Cycle Cost benefits, to the fleet over the life of the weapons system. These criteria were based on a new-engine/new-aircraft application where efficiency improvements due to ACC were used to reduce aircraft and engine size for a fixed mission (range, payload, etc.). The detailed operation and impact (cost, weight, reliability, maintainability) of the twelve final schemes were evaluated by adopting each of the candidate schemes to selected stages in the base engines. ACC showed a significant net benefit in the transport high pressure turbine. On the low pressure turbine some schemes showed a net savings, but the amount was small. For the fighter application, ACC showed a significant net benefit in the high pressure turbine only. GRA

N80-22353# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Antriebstechnik.
DESIGN AND INVESTIGATION OF STATIC PRESSURE COMPRESSOR CASCADES BEHIND IMPULSE-ROTORS Ph.D. Thesis - Technische Hochschule
Reinhold Fuchs Mar. 1979 119 p refs In GERMAN; ENGLISH summary Report will be also announced as translation (ESA-TT-629)
(DFVLR-FB-79-17) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,30

The design, optimization, and wind tunnel testing for two dimensional cascades are described. The cascades decelerate the rotor outlet velocity of about M = 2 to subsonic stator outlet velocity by a multiple shock system realizing a high static pressure ratio. The multiple shock cascades with turning and without were tested in a cascade wind tunnel and compared with results of computations. Author (ESA)

N80-22354# National Gas Turbine Establishment, Farnborough (England).
A DIGITAL COMPUTER PROGRAM FOR THE SUBSONIC FLOW PAST TURBOMACHINE BLADES USING A MATRIX METHOD
W. J. Calvert and D. J. L. Smith London Aeron. Res. Council Nov. 1976 68 p refs Supersedes NGTE-R-328; ARC-37294 (ARC-R/M-3838; BR70994; NGTE-R-328; ARC-37294) Avail: NTIS HC A04/MF A01; HMSO £10 PHI

A computer program which analyzes the inviscid, subsonic compressible pressure distributions around the blades of axial, radial, and mixed flow turbomachines is described. The flow equations are combined to form a governing, Poisson type differential equation for the stream function and the numerical solution is obtained by a finite difference matrix method. Solutions for several turbomachines, giving flow patterns and velocity distributions are included. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-22355 Dayton Univ., Ohio.
DESIGN OF AN INTEGRATED FLIGHT/FIRE CONTROL SYSTEM INCLUDING MOVABLE GUN AND GIMBALED LINE OF SIGHT TRACKER Ph.D. Thesis
John Hazen Blakelock 1979 354 p
Avail: Univ. Microfilms Order No. 8008431

The design, analysis, and hybrid simulation of an integrated flight/fire control system (IFFC) including a movable gun and gimbaled line of sight tracker for the F-15 are discussed. The analysis includes a linear root locus analysis of the various control systems and a detailed discrete analysis of the sampled-data control system resulting from closing the outer control loops through the digital computer used to compute the prediction angle and to generate the inputs to the flight control systems. The capability of the IFFC system was tested against various target scenarios using a hybrid simulation. The results show that the IFFC with the movable gun is able to track a wide variety of target scenarios, including inverted flight to track an aircraft performing a split S, with the gun on track for a major portion of each run. Dissert. Abstr.

N80-22356*# Joint Inst. for Advancement of Flight Sciences, Hampton, Va.
EFFECT OF A FLEXIBLY MOUNTED STORE ON THE FLUTTER SPEED OF A WING Final Report
Harry L. Runyan NASA. Langley Res. Center. Apr. 1980 25 p refs
(Grant NsG-1438)
(NASA-CR-159245) Avail: NTIS HC A02/MF A01 CSCL 01C

A passive system proposed for increasing the flutter speed of a wing with heavy concentrated weights involves the concept of mounting the store on a pitch pivot having a very low pitch stiffness relative to the wing stiffness. This concept was investigated utilizing a two dimensional approach involving 4 degrees of freedom, namely, wing bending, wing torsion, store pitch and store vertical translation. This preliminary analysis was very encouraging and the results demonstrate that, if the uncoupled store pitch frequency was below the wing bending frequency, the flutter speed was greatly increased. A second more complete analysis was developed utilizing a three dimensional structure, but retaining the two dimensional, incompressible unsteady airforces of Theodorsen. The details of the analysis are included. A.R.H.

N80-22357*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
THE DESIGN, TESTING AND EVALUATION OF THE MIT INDIVIDUAL-BLADE-CONTROL SYSTEM AS APPLIED TO GUST ALLEVIATION FOR HELICOPTERS Final Report
Robert Miller McKillip, Jr. Feb. 1980 92 p refs
(Grant NsG-2266)
(NASA-CR-152352; ASRL-TR-196-1) Avail: NTIS HC A05/MF A01 CSCL 01C

A type of active control for helicopters was designed and tested on a four foot diameter model rotor. A single blade was individually controlled in pitch in the rotating frame over a wide range of frequencies by electromechanical means. By utilizing a tip mounted accelerometer as a sensor in the feedback path, significant reductions in blade flapping response to gust were achieved at the gust excitation frequency as well as at super and subharmonics of rotor speed. E.D.K.

N80-22358*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESCRIPTION OF AN EXPERIMENTAL (HYDROGEN PEROXIDE) ROCKET SYSTEM AND ITS USE IN MEASURING AILERON AND RUDDER EFFECTIVENESS OF A LIGHT AIRPLANE
Thomas C. OBryan, Maxwell W. Goode, Frederick D. Gregory, and Marna H. Mayo May 1980 42 p refs

(NASA-TP-1647; L-12494) Avail: NTIS HC A03/MF A01 CSCL 01C

A hydrogen peroxide fueled rocket system, which is to be used as a research tool in flight studies of stall and spin maneuvers, was installed on a light, four place general aviation airplane. The pilot controlled rocket system produces moments about either the roll or the yaw body axis to augment or oppose the aerodynamic forces and inertial moments acting on the airplane during various flight maneuvers, including the spin. These controlled moments of a known magnitude can be used in various ways to help analyze and interpret the importance of the various factors which influence airplane maneuvers. The rocket system and its installation in the airplane are described, and the results of flight tests used to measure rudder and aileron effectiveness at airspeeds above the stall are presented. These tests also serve to demonstrate the operational readiness of the rocket system for future research operations. E.D.K.

N80-22359*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

DECOUPLER PYLON: WING/STORE FLUTTER SUPPRESSOR Patent Application

Wilmer A. Reed, III, inventor (to NASA) Filed 28 Mar. 1980 18 p

(NASA-Case-LAR-12468-1; US-Patent-Appl-SN-135057) Avail: NTIS HC A02/MF A01 CSCL 01C

A device for suspending a store from a support such as an aircraft wing is described. It comprises soft-spring means whereby the store pitch mode is decoupled from support modes and a low frequency active control mechanism which maintains store alignment. In the described embodiment, a pneumatic suspension system both isolates the store in pitch and, under conditions of changing mean load, aligns the store with the wing to which it is attached. The device allows the flutter speed of an aircraft flying with an attached store to be increased while reducing the sensitivity of flutter to changes in the pitch inertia and center of gravity location of the store. NASA

N80-22360# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

USING VERTICAL GUST ALLEVIATION TO IMPROVE THE TARGET TRACKING CAPABILITY OF THE CONTROL CONFIGURED YF-16 M.S. Thesis

Eric R. Molner Aug. 1979 278 p refs

(AD-A080520; AFIT/GGC/EE/79-5) Avail: NTIS HC A13/MF A01 CSCL 01/3

This thesis investigates the use of multiple aerodynamic control surfaces as a part of a flight control system configured to reduce aircraft pitch response to atmospheric disturbances. Coordinated deflection of two surfaces provides the desired gust alleviation with no decrease in system damping. At the same time, the commanded aircraft performance is improved relative to the performance of the baseline flight control system using a single control surface. The aircraft chosen for this analysis is the General Dynamics YF-16. This particular aircraft has a fly-by-wire electronic flight control system - an arrangement that permits the control surfaces to be electronically activated. A means of applying discrete vertical gusting to a modeled system is presented to permit evaluation of system performance. Using a simulation computer program, the YF-16 with baseline flight control system and Maneuver Enhancement augmentation are examined to determine gust response and pilot response characteristics. GRA

N80-22361# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE APPLICATION OF OUTPUT PREDICTIVE DIGITAL CONTROL TO WING FLUTTER SUPPRESSION AND TERRAIN FOLLOWING PROBLEMS M.S. Thesis

David E. Chaffin Dec. 1979 176 p refs

(AD-A080419; AFIT/GE/EE/79-9) Avail: NTIS HC A09/MF A01 CSCL 01/3

This thesis is a study of a digital control technique known as Output Predictive Control (OPC) or Model Algorithmic Control (MAC). In OPC, the behavior of the system is predicted using its impulse response function and the desired response is characterized by a reference trajectory. Controls are computed iteratively to drive the system output along the desired trajectory. In an earlier study, the system was made to follow the reference trajectory exactly, but only at the control application time; there were large oscillations of the output between control changes. In this study, the control calculation is reformulated as a least squares curve fit problem, allowing some deviation from the desired trajectory. This approach is applied as a regulator for a very lightly damped fourth-order single-input/single-output system and as a pitch axis autopilot in a simplified terrain following problem. A qualitative discussion of the robustness properties is included. The design of the controller is difficult due to the interrelationships of the internal parameters; however, the results of the terrain following example indicate that this is a viable approach for this problem. GRA

N80-22362# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ANALYSIS OF THE EFFECTS OF HIGHER ORDER CONTROL SYSTEMS ON AIRCRAFT APPROACH AND LANDING LONGITUDINAL HANDLING QUALITIES M.S. Thesis

Muhammad Anwar Pasha Dec. 1979 236 p refs

(AD-A080519; AFIT/GE/EE/79-27) Avail: NTIS HC A11/MF A01 CSCL 05/8

The approach and landing longitudinal flying qualities data generated by Calspan using variable stability NT-33 aircraft combined with significant control system dynamics was analyzed. Three different approaches were used to determine the relationship between pilot ratings and the pilot workload, system sensitivity, and the system performance. An open-loop frequency response analysis showed that for a particular crossover frequency and phase margin (fixed performance), the phase angle (pilot workload) and slope of the phase curve (system sensitivity) at the crossover frequency correlated well with the pilot ratings. An optimum pilot lead time for pitch tracking, flight path angle tracking, and both pitch and flight path angle tracking tasks is determined by a closed-loop analog simulation using integral error squared as a performance measure. A correlation is found between pilot ratings and performance. An attempt is made to explain the landing task as a closed-loop pitch and flight path angle tracking task. The open-loop impulse response of the pitch attitude showed that the initial delay and the transient behavior of the pitch response have a direct impact on the pilot ratings, pilot induced oscillations, and comments. GRA

N80-22363# European Space Agency, Paris (France).

CONTROL SYSTEM DESIGN USING VECTOR-VALUED PERFORMANCE CRITERIA WITH APPLICATION TO THE CONTROL RATE REDUCTION IN PARAMETER INSENSITIVE CONTROL SYSTEMS

Gerhard Kreisselmeier Dec. 1978 39 p refs Transl. into ENGLISH of "Reglerentwurf mit Vektoriellen Guetekriterien und Seine Praktische Anwendung zur Stellgeschwindigkeitsreduktion bei Parameterunempfindlichen Reglern", Rept. DLR-FB-77-55 DFVLR, Oberpfaffenhofen, Nov. 1977 Original report in GERMAN previously announced as X79-71736

(ESA-TT-512-Rev; DLR-FB-77-55-Rev) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 17

A design strategy is suggested which uses for the optimization of the control system, a vector-valued performance-criterion such that a systematic step-by-step improvement of the performance vector is achieved, i.e., at each stage the performance of some components is improved without impairing that of the others, so that finally the optimal design is obtained. This technique is used to design a parameter-insensitive flight-path controller which, compared with earlier designs, has both a larger reduction in sensitivity and a considerable reduction in the maximal control rate. The design shows that a controller can have considerably reduced sensitivity without increasing the demands on the actuator system. This result is due primarily to the control rate being directly considered in the design. The controller-synthesis technique based on vector-valued performance-criteria as here suggested is feasible even when the number of design aspects is large. Author (ESA)

N80-22364# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

DEFINITION OF A TWO LEVEL CONTROL SYSTEM FOR NONLINEAR AIRCRAFT MOTION

Albert Kirszenblat 1979 34 p refs In FRENCH; ENGLISH

summary Report will also be announced as translation (ESA-TT-614)
(ONERA-NT-1979-7; ISSN-0078-3781) Avail: NTIS HC A03/MF A01

The utilization of fly by wire control systems is discussed in terms of the improvement of aircraft handling qualities. An approach to the problem of defining a control law well adapted to the whole flight envelope is presented. This system has a two level structure allowing a task oriented control and an augmentation of the aircraft stability. A nonlinear model of the aircraft dynamics is described incorporating the inertial coupling term, and the nonlinear aerodynamic effects. The model generates a trajectory, a reference control law vector, and an output vector which tracks a vector. This vector represents the maneuvering objectives assigned by the pilot at any time. A servo compensation which subordinates the aircraft motion to the model is also given. The control law is obtained by application of the optimal linear control theory to local linear models of the aircraft. Direct force control surfaces were easily incorporated in the computation of the control system. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N80-22365# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
DEVELOPMENT OF THE A-6/CIRCULATION CONTROL WING FLIGHT DEMONSTRATOR CONFIGURATION Final Report, Sep. 1975 - Jul. 1978
Robert J. Englar Jan. 1979 158 p refs
(AD-A081241; DTNSRDC/ASED-79-01) Avail: NTIS HC A08/MF A01 CSCL 14/2

Wind tunnel investigations were conducted on a 1/8.5 scale model of the A-6/circulation control wing flight demonstrator aircraft in order to confirm the high lift capability of the concept, to improve lifting and control surfaces and to provide supporting data to assure safety of flight and adequate handling of the full-scale aircraft. The best configuration developed during these investigations produced a 2.2 fold increase in maximum coefficient of lift over the conventional A-6A high lift configuration. This circulation control wing configuration was compromised to simplify testbed aircraft modifications, reduce construction costs, and provide a larger range of parameters obtainable during flight testing, yet in the final configuration, still provided trimmed aerodynamic maximum coefficient of lift double that of the standard A-6A. A.R.H.

N80-22366*# Old Dominion Univ. Research Foundation, Norfolk, Va.
AUTOMATIC CONTROL OF A LIQUID NITROGEN COOLED, CLOSED-CIRCUIT, CRYOGENIC PRESSURE TUNNEL Progress Report, Oct. 1979 - Mar. 1980
S. Balakrishna and G. L. Goglia Mar. 1980 103 p refs
(Grant NsG-1503)
(NASA-CR-162636) Avail: NTIS HC A06/MF A01 CSCL 01E

The control system design, performance analysis, microprocessor based controller software development, and specifications for the Transonic Cryogenic Tunnel (TCT) are discussed. The control laws for the single-input single-output controllers were tested on the TCT simulator, and successfully demonstrated on the TCT. F.O.S.

N80-22367*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH VOLTAGE SPARK CARBON FIBER DETECTION SYSTEM
Lien C. Yang 15 Apr. 1980 96 p refs
(Contract NAS7-100)
(NASA-CR-162995; JPL-Pub-80-30) Avail: NTIS HC A05/MF A01 CSCL 14B

The pulse discharge technique was used to determine the length and density of carbon fibers released from fiber composite materials during a fire or aircraft accident. Specifications are given for the system which uses the ability of a carbon fiber to initiate spark discharge across a high voltage biased grid to achieve accurate counting and sizing of fibers. The design of the system was optimized, and prototype hardware proved satisfactory in laboratory and field tests. A.R.H.

N80-22368*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MAGNETIC SUSPENSION AND BALANCE SYSTEM: A SELECTIVE ANNOTATED BIBLIOGRAPHY
Marie H. Tuttle, Robert A. Kilgore, and Richmond P. Boyden Apr. 1980 47 p
(NASA-TM-80225; L-13196) Avail: NTIS HC A03/MF A01 CSCL 14E

This bibliography, with abstracts, consists of 188 citations arranged in chronological order by dates of publication. Selection of the citations was made for their relevance to the problems involved in understanding, designing, and constructing magnetic suspension and balance systems for use in wind tunnels. Author

N80-22369*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL SUPPLEMENTARY MACH NUMBER MINIMUM SECTION INSERT Patent Application
Lana M. Couch, inventor (to NASA) Filed 28 Mar. 1980 12 p
(NASA-Case-LAR-12532-1; US-Patent-Appl-SN-135040) Avail: NTIS HC A02/MF A01 CSCL 14B

A device which changes the Mach number capability of a wind tunnel without permanently altering the existing nozzle of the tunnel is described. An insert is attached to the wall of the existing nozzle expansion area creating a second minimum section upstream of the model test section. The added insert may be removed without complicated and expensive changes to the basic wind tunnel. In the embodiment illustrated, a removable insert is disposed within the wind tunnel nozzle walls with a portion of the flow boundary layer being bled off from the tunnel via a passageway and tunnel exit to reduce the extent of separated flow normally occuring upstream of the insert contraction section. NASA

N80-22370# California Univ., Livermore. Lawrence Livermore Lab.
DEVICES FOR LAUNCHING 0.1-G PROJECTILES TO 150 KM/S OR MORE TO INITIATE FUSION. PART 2: RAILGUN ACCELERATORS
R. S. Hawke 6 Jul. 1979 54 p refs
(Contract W-7405-eng-48)
(UCRL-52778-Pt-2) Avail: NTIS HC A04/MF A01

The possibility of using a railgun accelerator to launch 0.1-g projectiles to hypervelocities (150 km/s or more) to initiate thermonuclear fusion was studied. The analysis revealed that a railgun with a plasma arc armature is a viable approach to the goal. The railgun's probable performance was calculated and calculations that predict the amount of erosive drag between projectile and rail are presented. The properties of railgun and projectile materials which impose operational limits are delineated. DOE

N80-22371# Defence Research Information Centre, Orpington (England).
A MEANS OF SPECIFYING A STANDARD REFERENCE WET SURFACE FOR MILITARY AIRCRAFT
R. W. Sugg (Mech. Eng. Res. and Develop.) London HMSO Oct. 1979 15 p refs
(S/T-Memo-1/79; BR70262) Avail: NTIS HC A02/MF A01

The British civil aircraft requirements (BCAR) method of aircraft certification under wet conditions and the correction of stopping distances to a standard using a friction trailer is studied. The method is also examined for military aircraft. The use of the standard to accident investigation procedures and NATO standards is discussed. A standard military reference wet surface

and a way to correct aircraft performance to the standard are examined. Author (ESA)

N80-22372# Defence Research Information Centre, Orpington (England).
AN INVESTIGATION INTO MEASURING RUNWAY SURFACE TEXTURE BY THE GREASE PATCH AND OUTFLOW METER METHODS
R. W. Sugg (Mech. Eng. Res. and Develop.) London HMSO Oct. 1979 33 p refs
(S/T-Memo-2/79; BR70263) Avail: NTIS HC A03/MF A01

A measurement of surface texture was used by some organizations as a means of specifying runway friction for stop distance calculations and certification purposes in spite of the conclusion by the American Society for Testing and Materials (ASTM) that it should be discontinued. A method of using surface texture to predict friction of ground vehicles at high speed was studied and it is concluded that within the limits found on runways it has only a very small effect on the prediction. It is recommended that where high speed prediction is necessary a more accurate method is to use equations based on test data. The difficulty in arriving at a single figure for surface texture was demonstrated by showing the variation that can occur along a runway and the large difference in readings between operators. Author (ESA)

N80-22373# Royal Aircraft Establishment, Farnborough (England).
TESTS ON PNEUMATICALLY POWERED PRECISION FORCE GENERATORS
R. D. Law London HMSO Jan. 1979 35 p refs
(RAE-TM-Aero-3449; RAE-TR-79013; BR68395) Avail: NTIS HC A03/MF A01

The performance of two different types of pneumatic force generators was assessed covering forces up to a 100 kN, with a view to their use in balance calibrations in the RAE 5 m wind tunnel. Tests were performed on the force generators using a precision pneumatic control system, first in conjunction with a static balance test rig, followed by a series of tests to check the overall accuracy of performance against the 'dead-weight' force standard machines. Force generators using a rolling diaphragm seal produce forces to an accuracy within 0.01% of maximum output assuming a linear calibration. Individual values of force output are repeated to 0.003% of maximum output when checked against a simple balance under fixed experimental conditions. Author (ESA)

N80-22374# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfs-Aerodynamik.
GRAVIMETRIC INVESTIGATION OF THE PARTICLE NUMBER DENSITY DISTRIBUTION FUNCTION IN THE HIGH SPEED CASCADE WIND TUNNEL FOR LASER-ANEMOMETRY MEASUREMENTS
Harro Bessling and Torsten Hinz (Bundesforschungsanstalt fuer Landwirtsch.) Jan. 1979 39 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-625)
(DFVLR-FB-79-12) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8.50

The conditions in high speed cascade wind tunnels were investigated to determine for the use of laser anemometers in measuring flow velocities. The natural particle number density present in the cascade wind tunnel was found insufficient for the application of the laser method. The effect of adding aerosols to increase the number of particles in the wind tunnel is discussed. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N80-22375*# Rockwell International Corp., Downey, Calif.
SPACE CONSTRUCTION SYSTEM ANALYSIS. PART 2: CONSTRUCTION ANALYSIS Final Report
J. A. Roebuck, P. A. Buck, G. W. Gimlich, H. S. Greenberg, R. J. Hart, J. Indrikis, A. E. LeFever, A. N. Lillenas, C. K. McBaine et al Apr. 1980 776 p
(Contract NAS9-15718)
(NASA-CR-160579; SSD-80-0038-Pt-2) Avail: NTIS HC A99/MF A01 CSCL 22A

The construction methods specific to the end to end construction process for building the ETVP in low Earth orbit, using the space shuttle orbiter as a construction base, are analyzed. The analyses concerned three missions required to build the basic platform. The first mission involved performing the fabrication of beams in space and assembling the beams into a basic structural framework. The second mission was to install the forward support structure and aft support structure, the forward assembly, and a TT&C antenna. The third mission plan was to complete the construction of the platform and activate it to begin operations in low Earth orbit. The integration of the activities for each mission is described along with the construction requirements and construction logic. A.W.H.

N80-22376*# Rockwell International Corp., Downey, Calif. Space Operations and Satellite Systems Div.
SPACE CONSTRUCTION SYSTEM ANALYSIS. PART 2: COST AND PROGRAMMATICS Final Report
F. W. VonFlue and W. Cooper Apr. 1980 76 p
(Contract NAS9-15718)
(NASA-CR-160580; SSD-80-0039-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 22A

Cost and programmatic elements of the space construction systems analysis study are discussed. The programmatic aspects of the ETVP program define a comprehensive plan for the development of a space platform, the construction system, and the space shuttle operations/logistics requirements. The cost analysis identified significant items of cost on ETVP development, ground, and flight segments, and detailed the items of space construction equipment and operations. A.W.H.

N80-22377*# Rockwell International Corp., Downey, Calif.
SPACE CONSTRUCTION SYSTEM ANALYSIS. PART 2: SPACE CONSTRUCTION EXPERIMENTS CONCEPTS Final Report
J. A. Boddy, L. F. Wiley, G. W. Gimlich, H. S. Greenberg, R. J. Hart, A. E. LeFever, A. N. Lillenas, and R. S. Totah Apr. 1980 261 p
(Contract NAS9-15718)
(NASA-CR-160581; SSD-80-0040-Pt-2) Avail: NTIS HC A12/MF A01 CSCL 22A

Technology areas in the orbital assembly of large space structures are addressed. The areas included structures, remotely operated assembly techniques, and control and stabilization. Various large space structure design concepts are reviewed and their construction procedures and requirements are identified. A.W.H.

N80-22378*# LinCom Corp., Pasadena, Calif.
SPS PHASE CONTROL SYSTEM PERFORMANCE VIA ANALYTICAL SIMULATION
W. C. Lindsey, A. V. Kantak, C. M. Chie, and R. W. D. Booth Mar. 1979 222 p refs
(Contract NAS9-15725)
(NASA-CR-160582; TR-7903-0977) Avail: NTIS HC A10/MF A01 CSCL 22A

A solar power satellite transmission system which incorporates automatic beam forming, steering, and phase control is discussed. The phase control concept centers around the notation of an active retrodirective phased array as a means of pointing the beam to the appropriate spot on Earth. The transmitting antenna (spacetenna) directs the high power beam so that it focuses on the ground-based receiving antenna (rectenna). A combination of analysis and computerized simulation was conducted to determine the far field performance of the reference distribution system, and the beam forming and microwave power generating systems. A.R.H.

N80-22379*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE ORBIT IMU ALIGNMENT. SINGLE-PRECISION COMPUTATION ERROR

C. R. McClain Mar. 1980 31 p
(NASA-TM-80793; JSC-16468; Rept-80-FM-18) Avail: NTIS HC A03/MF A01 CSCL 22A

The source of computational error in the inertial measurement unit (IMU) onorbit alignment software was investigated. Simulation runs were made on the IBM 360/70 computer with the IMU orbit alignment software coded in hal/s. The results indicate that for small IMU misalignment angles (less than 600 arc seconds), single precision computations in combination with the arc cosine method of eigen rotation angle extraction introduces an additional misalignment error of up to 230 arc seconds per axis. Use of the arc sine method, however, produced negligible misalignment error. As a result of this study, the arc sine method was recommended for use in the IMU onorbit alignment software. R.E.S.

N80-22380*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ONORBIT IMU ALIGNMENT ERROR BUDGET
R. W. Corson Mar. 1980 22 p
(NASA-TM-80794; JSC-16463) Avail: NTIS HC A02/MF A01 CSCL 22A

The Star Tracker, Crew Optical Alignment Sight (COAS), and Inertial Measurement Unit (IMU) from a complex navigation system with a multitude of error sources were combined. A complete list of the system errors is presented. The errors were combined in a rational way to yield an estimate of the IMU alignment accuracy for STS-1. The expected standard deviation in the IMU alignment error for STS-1 type alignments was determined to be 72 arc seconds per axis for star tracker alignments and 188 arc seconds per axis for COAS alignments. These estimates are based on current knowledge of the star tracker, COAS, IMU, and navigation base error specifications, and were partially verified by preliminary Monte Carlo analysis. R.E.S.

N80-22381# Committee on Science and Technology (U. S. House).
UNITED STATES AND SOVIET PROGRESS IN SPACE: SUMMARY DATA THROUGH 1979 AND A FORWARD LOOK
Charles S. Sheldon, II Washington GPO Apr. 1980 100 p Presented to the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., Apr. 1980 Prepared by Congressional Research Service, Library of Congress
(GPO-59-476) Avail: SOD HC

The U.S. and Soviet space program are both large and comprehensive, competing across a broad spectrum of military applications, civil applications, orbital science, and deep space exploration. In recent years, the Soviet program has been the larger of the two, but answering who is ahead involves complex qualitative judgments. A brief history of how far the two major space powers have come in the past 22 years is presented. Specific aspects examined relate to (1) supporting resources for space flight; (2) manned flight comparison; (3) military vs civilian spce activities; (4) space application; and (6) future directions. A.R.H.

N80-22382# European Space Agency, Paris (France).
STRUCTURE AND SEGREGATIONS IN THE SOLIDIFICATION OF COMMERCIAL ALLOYS. STUDY ON THE POSSIBILITIES OF CARRYING OUT TESTS IN SPACELAB
Dieter Neuschuetz, Wigbert Gans, Hubert Coenen, and Juergen Poetschke Jul. 1979 22 p refs Transl. into ENGLISH of "Gefuegeausbildung und Seigerungen beim Erstarren Technischer Legierungen - Studie ueber Untersuchungsmoeglichkeiten im Spacelab", Rept. BMFT-FB-W-77-08 DFVLR, Cologne and Fried. Krupp G.m.b.H., Essen, 5 Oct. 1978 Original report in GERMAN previously announced as X79-72119
(ESA-TT-539-Rev; BMFT-FB-W-77-08-Rev) Avail: NTIS HC A02/MF A01; ZLDI, Munich DM 5.90

The experimental possibilities offered by Spacelab in the domain of the structure and segregation of metals and alloys undergoing solidification are examined. A systematic analysis is made of the influence of weightlessness on the solidification of metallic melts, the preparation of a schedule of conceivable Spacelab experiments, their critical discussion, and the selection and description of the following recommendable experiments: interaction between an advancing solidification front and suspended impurities, coagulation of solid particles in metallic melts, and interfacial diffusion along the solidification front. Author (ESA)

N80-22383# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
INTERSTELLAR FLIGHT: CHALLENGE AND CHANCE
Harry O. Ruppe Apr. 1977 26 p refs
(TUM-LRT-RT-KB-77/15) Avail: NTIS HC A03/MF A01

Information on planets outside the solar system is reviewed in view of possible exploratory missions. Project Daedalus, an interstellar ship based on a nuclear fusion drive is discussed along with other propulsion alternatives. Unmanned interstellar probes are discussed. Author (ESA)

N80-22384# European Space Agency, Paris (France).
BIORACK, A SPACELAB MULTIPURPOSE FACILITY. CELL AND MOLECULAR BIOLOGY: REPORT ON THE TECHNICAL FEASIBILITY STUDY
8 Jan. 1980 45 p
(ESA-DP/ST(80)1) Avail: NTIS HC A03/MF A01

The scientific objectives, performance requirements, design characteristics, auxiliary equipment, crew training and development, and manufacture schedule of the Biorack research facility are analyzed. Fourteen representative candidate experiments on the influence of the space environment on living matter were selected to serve as reference experiments for the technical feasibility and cost study. It is shown that the necessary hardware can be accomodated in a single Spacelab rack. The single components are interchangable and allow a flexible approach to each mission and scientific requirement. The detailed design, development, manufacture, integration and testing of Biorack require approximately 35 months. Author (ESA)

N80-22385# European Space Agency, Paris (France).
THE INTERNATIONAL COMET MISSION: REPORT ON THE PHASE A STUDY
5 Dec. 1979 68 p refs
(ESA-SCI(79)11) Avail: NTIS HC A04/MF A01

The scientific objectives, mission analysis, system design and management, and time schedule for the Halley, Tempel 2 Comet Mission are outlined. Current knowledge concerning the nature and origin of comets, including the nucleus, coma, and interaction with the solar wind is summarized. Instrumentation and payload of the spacecraft and the ESA probe are described along with design features. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N80-22386*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ELLIPTIC ANOMALY
Guy Janin (European Space Operations Center, Darmstadt, West Germany) and Victor R. Bond Apr. 1980 15 p refs
(NASA-TM-58228) Avail: NTIS HC A02/MF A01 CSCL 22A

An independent variable different from the time for elliptic orbit integration is used. Such a time transformation provides an analytical step-size regulation along the orbit. An intermediate anomaly (an anomaly intermediate between the eccentric and the true anomaly) is suggested for optimum performances. A particular case of an intermediate anomaly (the elliptic anomaly) is defined, and its relation with the other anomalies is developed. Author

N80-22387# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INCLINED ELLIPTICAL ORBIT AND ASSOCIATED SATELLITE FIELD OF VIEW
Yi-Lee C. Lo 26 Sep. 1979 15 p ref
(Contract F19628-78-C-0002; AF Proj. 1227)
(AD-A080633; TN-1979-62; ESD-TR-79-229) Avail: NTIS HC A02/MF A01 CSCL 22/3

The 12 hour inclined elliptical satellite orbits are studied. The variations of the satellite range and field of view are plotted as a function of time since apogee passage. GRA

N80-22388# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A PHYSICIST'S GUIDE TO J SUB 2
Laurence G. Taff 3 Aug. 1979 41 p
(Contract F19628-78-C-0002; AF Proj. 2128)
(AD-A080492; TN-1979-50; ESD-TR-79-194) Avail: NTIS HC A03/MF A01 CSCL 22/3

This report presents a first-order discussion of the perturbations in the orbital motion of a satellite about an oblate primary. The approach is non-traditional in that the secular changes in the semi-major axis, eccentricity, inclination, and longitude of the ascending node are all derived directly from the translational and rotational equations of motion. The exactly solvable problem of motion in the primary's equatorial plane is used to obtain the advance of the argument of periastron the consequent change in the time of periastron passage. In addition, a simple discussion of a very restricted three body problem is given to illustrate of the effects of third body perturbations. GRA

N80-22389# European Space Agency, Paris (France).
A SEMINUMERICAL PROCEDURE FOR THE CALCULATION OF GEOSTATIONARY ORBIT PERTURBATIONS CAUSED BY THE SUN AND THE MOON
M. C. Eckstein Aug. 1978 28 p refs Transl. into ENGLISH of "Ein Halbnumerisches Verfahren zur Berechnung der Stoerungen einer Geostationaeren Bahn durch Sonne und Mond", Rept. DLR-IB-552-77/23 DFVLR Oberpfaffenhofen, Sep. 1977 Original report in GERMAN previously announced as X79-73159
(ESA-TT-485-Rev; DLR-IB-552-77/23) Avail: NTIS HC A03/MF A01

A simplified semi-numerical perturbation method was developed for the special case of nearly geostationary satellites for orbits perturbed by the Sun and Moon. Whereas the analytical form of the perturbation terms can be derived from geometrical considerations, the coefficients are determined by multiple Fourier analysis of the perturbation equations. The perturbations are expressed in terms of equinoctial elements to avoid singularities for zero eccentricity and inclination. The expressions generated by the computer program are presented in the form of subprograms. Author (ESA)

N80-22390# European Space Agency, Paris (France).
INVESTIGATIONS TO DETERMINE THE ORBIT OF A EUROPEAN MICROWAVE SATELLITE
E. F. Jochim Aug. 1978 50 p refs Transl. into ENGLISH of "Untersuchung zur Bahnauslegung eines Europaeischen Mikrowellensatelliten", Rept. DLR-IB-552-77/26 DFVLR, Oberpfaffenhofen, Oct. 1977
(ESA-TT-486-Rev; DLR-IB-552-77/26) Avail: NTIS HC A03/MF A01

The fundamental relationships between orbital mechanics and coverage geometry for Earth reconnaissance satellites are presented in table and diagram form. As a preliminary to a mission study for Earth reconnaissance satellites using a microwave sensor (synthetic aperture radar) and an optical sensor, covering an area as far as possible simultaneously, three mission models were investigated for a given orbit height. In the final choice of orbit trade-off decisions must be made by the user. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N80-22391# Committee on Government Operations (U. S. House).
THE FALL OF NASA'S SKYLAB: THE COMMUNICATIONS PROBLEM
Washington GPO 1980 35 p refs Rept. presented by the Comm. on Govt. Operations to the Comm. of the Whole House on the State of the Union, 96th Congr., 2nd Sess., 11 Mar. 1980
(H-Rept-96-818; GPO-59-262; Rept-14) Avail: US Capitol, House Document Room

The nature, extent, and reasons for the failure of Skylab are reviewed. The internal planning problem and external information dissemination problem faced by NASA when the agency announced that Skylab would fall within the year and that rescue efforts would be dropped are examined in the light of the statutory regulation to provide the widest possible and appropriate disclosure of information. Issues discussed include (1) treatment of the orbital debris hazard; (2) legal responsibility for damage from Skylab; (3) degree of clarity in plans for alerting the public immediately before descent; (4) inadequate information on location and effect of impact; and (5) responses regarding pre-or post-impact retrieval. Findings, conclusions and recommendations are included. Important issues still unresolved are cited. A.R.H.

N80-22392*# Rockwell International Corp., Downey, Calif. Space Operations and Satellite Systems. Div.
SPACE CONSTRUCTION SYSTEM ANALYSIS. PART 2: PLATFORM DEFINITION Final Report
R. J. Hart, H. L. Myers, R. D. Abramson, P. N. DeJong, R. D. Donavan, H. S. Greenberg, J. Indrikis, J. S. Jandrasi, M. Manoff, C. K. McBaine et al Apr. 1980 312 p
(Contract NAS9-15718)
(NASA-CR-160578; SSD-80-0037-Pt-2) Avail: NTIS HC A14/MF A01 CSCL 22B

The top level system requirements are summarized and the accompanying conceptual design for an engineering and technology verification platform (ETVP) system is presented. An encompassing statement of the system objectives which drive the system requirements is presented and the major mission and subsystem requirements are described with emphasis on the advanced communications technology mission payload. The platform design is defined and used as a reference configuration for an end to space construction analyses. The preferred construction methods and processes, the important interactions between the platform design and the construction system design and operation, and the technology development efforts required to support the design and space construction of the ETVP are outlined. A.W.H.

N80-22393# Range Commanders Council, White Sands Missile Range, N. Mex. Safety Group.
RANGE SAFETY TRANSMITTING SYSTEMS, 406-549 MHz BAND
Nov. 1979 114 p Supersedes RSG-307-65
(AD-A080471; RSG-307-79; RSG-307-65) Avail: NTIS HC A06/MF A01 CSCL 17/2

The transmitting systems described herein comprise the basic command destruct transmitting systems in use at the various RCC member and associate member ranges. Sections describing each range's system and configuration and specifications for the various system components are also provided. Users of this document are encouraged to contact the range of interest to determine current configurations and obtain more detailed descriptions. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-22394*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSONIC PRESSURE AND LOAD DISTRIBUTIONS FOR A GROUP OF SIMULATED LAUNCH VEHICLES
Thomas C. Kelly Apr. 1980 216 p refs
(NASA-TM-80195; L-13365) Avail: NTIS HC A10/MF A01 CSCL 22B

Pressure and load distributions for a related group of simulated launch vehicle configurations are presented. The configurations were selected so that the nose cone and interstage transition flare components were relatively close to one another and subject to mutual interference effects. Tests extended over a Mach number range from 0.40 to 1.20 at angles of attack from 0 deg to about 10 deg. The test Reynolds numbers, based on main stage diameter, were of the order of 0.00000098. E.D.K.

N80-22395# Auburn Univ., Ala. Engineering Experiment Station.
AN ANALYSIS OF THE EFFECTS OF TRANSVERSE VIBRATION ON THE ATTITUDE MOTION OF FREE-FLIGHT ROCKETS Final Report, 15 Dec. 1978 - 15 Dec. 1979
John E. Cochran, Jr., Grant A. Castleberry, and Stephen D. Rew Redstone Arsenal, La. Army Missile Command. 14 Dec. 1979 103 p refs
(Contract DAAK40-79-C-0030)
(AD-A080606; DRSMI/RL-CR-80-2) Avail: NTIS HC A06/MF A01 CSCL 19/4

The results of an analysis of the effects of transverse vibration of a spinning, flexible, free-flight rocket during its guidance phase on its attitude motion subsequent to end of guidance (EOG) are presented. Two models of a spinning, flexible, free-flight rocket are described. One is a simple two body model. The other is a 'continuous' model. A physical explanation is given for the way transverse vibration during the guidance phase causes the appearance of a transverse angular rate at EOG. The two body model is used to obtain a simple equation from which estimates of the transverse angular rate can be found. Typical results from the two models are presented and agreement between the results is shown. GRA

N80-22396# European Space Agency, Paris (France).
THE USE OF RAM ROCKETS FOR HIGH ALTITUDE MISSILES
E. Riester Dec. 1978 72 p refs Transl. into ENGLISH of "Die Anwendung von Staustrahlraketen bei Flugkoerpern in Grosseren Hoehen", Rept. DLR-FB-77-47 DFVLR, Brunswick, Oct. 1977 Original report in GERMAN previously announced as X79-71390
(ESA-TT-505; DLR-FB-77-47) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 29.60

The conditions under which a ram rocket is superior to a rocket as a power plant for the cruising phase of high altitude supersonic missiles are analyzed and defined. The influence of mission and power plant parameters on the payload of both kinds of engine units is investigated. The advantages of a booster-ram rocket combination over a two-stage rocket are pointed out. This advantage can be increased if the booster acceleration is terminated before the cruise velocity is reached and the ram rocket then continues the acceleration. In that case, the payload attains a maximum at a particular final booster velocity. The working regimes in the ram rocket combustion chamber needed to obtain these optimal conditions are deduced. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see *also 03 Air Transportation and Safety and 85 Urban Technology and Transportation.*

N80-22397*# Boeing Aerospace Co., Seattle, Wash.
TECHNOLOGY REQUIREMENTS FOR FUTURE EARTH-TO-GEOSYNCHRONOUS ORBIT TRANSPORTATION SYSTEMS. VOLUME 1: EXECUTIVE SUMMARY Final Report
Vincent A. Caluori, Robert T. Conrad, and James C. Jenkins Apr. 1980 40 p refs
(Contract NAS1-15301)
(NASA-CR-3265) Avail: NTIS HC A03/MF A01 CSCL 22B

Technologies including accelerated technology that are critical to performance and/or provide cost advantages for future space transportation systems are identified. Mission models are scoped and include priority missions, and cargo missions. Summary data, providing primary design concepts and features, are given for the SSTO, HLLV, POTV, and LCOTV vehicles. Significant system costs and total system costs in terms of life cycle costs in both discounted and undiscounted dollars are summarized for each of the vehicles. E.D.K.

N80-22398# European Space Agency, Paris (France).
FEASIBILITY STUDY OF A SPACELAB EXPERIMENTAL PLATFORM (SEAP)
D. Manski and P. Natenbruk Oct. 1978 460 p refs Transl. into ENGLISH of "Konzept- und Durchfuehrbarkeitsstudie einer Spacelab-Experimenten-Antriebsplattform (SEAP)", Rept. BMFT-FB-W-77-47 DFVLR, Cologne and ERNO Raumfahrttech. G.m.b.H., Bremen, Dec. 1977 Original report in GERMAN previously announced as X79-71394
(ESA-TT-495; BMFT-FB-W-77-47) Avail: NTIS HC A20/MF A01; ZLDI, Munich DM 96

The concept of a small Spacelab experiment propulsion platform to accomodate small free-flying shuttle payloads is considered. The orbit maneuvering propulsion system of the platform would economically utilize a monopropellant hydrazine system, while the eight attitude control thrusters of the fully three-axis stabilized system would use cold gas. The energy supply and telemetry/telecommand systems for the platform would be carried onboard, but due to the broad applicability of the design the energy for each payload cannot be provided by the platform. The platform could remain completely stabilized for a longer time in space, execute orbit maneuvers, and then return under its own power to the shuttle. Lightweight construction for the platform as well as highly energetic propulsion systems are unnecessary due to the relatively small specific shuttle costs. Thus it is possible to manufacture the platform cheaply, and more frequent utilization for the many free-flying shuttle experiments of the 80 s will be possible. Author (ESA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see *also 04 Aircraft Communications and Navigation* and *32 Communications.*

N80-22399# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
STAR PATTERN RECOGNITION AND SPACECRAFT ATTITUDE DETERMINATION, PHASE 1 Interim Report, FY 1978
John L. Junkins, Thomas E. Strikwerda, and L. Glenn Kraige Oct. 1978 67 p refs
(Contract DAAK70-78-C-0038)
(AD-A080355; VPI-E-79-4; ETL-0173) Avail: NTIS HC A04/MF A01 CSCL 17/7

A new strapped down system for on board, real time spacecraft attitude determination is discussed. The electro-optical system is capable of sub-ten-arc second precision with no moving parts. The light-sensitive element is an array-type Charged Coupled Device (CCD) having about 2 x 10 to the 5th power silicon pixels. Parallel, high speed analog circuits scan the pixels (row by row) to locate and A/D convert only those pixel response values (about 100 to 200 per scan) about a preset analog threshold. Angular rate measurements from conventional rate gyros are used to estimate motion continuously. Three intermittently communicating microcomputers operate in parallel to perform the functions: (1) star image centroid determination; (2) star pattern identification and discrete attitude estimation (subsets of measured stars are identified as specific cataloged stars); (3) optimal Kalman attitude motion estimation/integration. The system is designed to be self-calibrating with provision for routine updating of interlock angles, gyro bias parameters, and other system calibration parameters. For redundancy and improved precision, two optical ports are

employed. This interim report documents Phase I of a three phase effort to research, develop, and laboratory test the basic concepts of this new system. Included in Phase I is definition, formulation, and test of the basic algorithms, including preliminary implementations and results from a laboratory microcomputer system. GRA

N80-22400# Ocean Electronic Applications, Inc., Key Biscayne, Fla.
AN ADAPTIVE TECHNIQUE FOR THE ACOUSTIC TRANSMISSION OF DIGITAL DATA FROM SUBOCEAN PLATFORMS Final Report, Sep. 1978 - Nov. 1979
Eric J. Softley Nov. 1979 88 p refs
(Contract DI-14-08-0001-17231)
(PB80-113541; OEA-790201) Avail: NTIS HC A05/MF A01 CSCL 09F

The technology of acoustic telemetry of data from underwater platforms was evaluated. Adaptive adjustment of the acoustic parameters together with the use of digital filtering are the foundation to the approach. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-22401# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
ROTATING VALUE FOR VELOCITY COUPLED COMBUSTION RESPONSE MEASUREMENTS Final Scientific Report, 1 Jan. 1977 - 30 Sep. 1979
R. S. Brown and R. C. Waugh 30 Nov. 1979 80 p refs
(Contract F49620-77-C-0048; AF Proj. 2308)
(AD-A080220; AFOSR-80-0055TR) Avail: NTIS HC A05/MF A01 CSCL 21/8

GSD has investigated the dual valve approach for measuring propellant velocity coupled characteristics. Analytical studies have developed a mathematical analysis of the transient ballistics. The solution of the transient mass, momentum, and energy equations incorporates both linear and nonlinear velocity coupling, as well as pressure coupling, particle damping, flow turning, and nozzle losses in the analysis. The analysis shows that velocity coupling dominates the system response when the two valves operate 180 deg out of the phase. The analytical solutions agree with known solutions for low frequency, bulk mode conditions and for the frequency response characteristics at acoustic resonance. Studies were conducted to explore the limitations of the dual valve approach and to estimate the effects of experimental uncertainties. Parametric studies using the linear velocity coupling model indicated properties of the solution that suggested an approximate method for deriving the response from pressure data using the linear velocity coupling assumption. Parametric studies were also made using the nonlinear velocity coupling model. The results show the interaction of mean velocity magnitude, threshold velocity, and amplitude of the velocity oscillation on the predicted pressure oscillations. A method was developed to derive the velocity response from experimental data for a given threshold velocity, but no method was found for deriving threshold velocity from experimental data. GRA

N80-22402# Princeton Univ., N. J. Plasma Physics Lab.
INTERSTELLAR PROPULSION USING A PELLET STREAM FOR MOMENTUM TRANSFER
C. E. Singer Oct. 1979 20 p refs Submitted for publication
(Contract EY-76-C-02-3073)
(PPPL-1583) Avail: NTIS HC A08/MF A01

A pellet stream concept for interstellar propulsion is described. Small pellets are accelerated in the solar system and accurately guided to an interstellar probe where they are intercepted and transfer momentum. The propulsion system appears to offer orders of magnitude improvements in terms of engineering simplicity and power requirements over any other known feasible system for transport over interstellar distance in a time comparable to a human lifespan. DOE

N80-22403# European Space Agency, Paris (France).
COMBUSTION OF BORON IN AIRBREATHING ROCKETS: EFFECTS OF THE SECONDARY COMBUSTION CHAMBER
Antonios Boussios Jul. 1979 44 p refs Transl. into ENGLISH of "Verbrennung von Bor in Luftatmenden Raketenantrieben - Sekundaerbrennkammerprozesse", Rept. DFVLR-FB-78-03 DFVLR, Brunswick, Jan. 1978 Original report in GERMAN previously announced as X79-72110
(ESA-TT-535; DFVLR-FB-78-03) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 20,40

A performance comparison was calculated for a solid propellant containing 50% by weight of boron, and a powder injection where the propellant contained between 50% and 90% by weight of boron. The efficiency of combustion in the secondary chamber of an airbreathing rocket having powder injection was investigated using pressure changes from 2.5 to 11 bar, while keeping the boron percentage constant. A variation keeps the pressure constant and varies the boron percentage in the propellant between 50.5% and 87% by weight of boron. Author (ESA)

N80-22404# European Space Agency, Paris (France).
HOT GAS SIDE HEAT TRANSFER COEFFICIENTS IN HIGH ENERGY ROCKET ENGINES WITH THRUST VARIATIONS
Hans J. Sternfeld Dec. 1978 75 p refs Transl. into ENGLISH of "Heissgasseitage Waermeubergangszahlen in Hochenergetischen Raketentriebwerken bei Schubvariation", Rept. DLR-FB-77-42 DFVLR, Lampoldshausen, West Germany, Aug. 1977 Original report in GERMAN previously announced as X79-71772
(ESA-TT-502-Rev; DLR-FB-77-42) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 29,90

The hot gas side heat transfer coefficient and heat flux in the combustion chamber and nozzle of oxygen/hydrogen, fluorine/hydrogen, and fluorine/ammonia rocket engines were determined. Thrust variation of the capacitatively cooled experimental rocket engines between 200 N and 1500 N was provided by a combustion chamber pressure variation between 3 bars and 15 bars. The results are presented as correlation equations of the form St = A x Re (B) x Pr (C). The local hot gas side heat transfer coefficient was determined from the measured unsteady wall temperature distribution of the engine. The one dimensional analysis was based on the energy conservation law for the heat conductor. The measured temperature field was approximated by approximation functions in space and time.
Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N80-22405# Fiat Research Center, Orbassano (Italy).
AN APPROACH TO THE CORRELATION BETWEEN THE DEGREE OF CROSSLINKING OF ORGANIC COATINGS AND THEIR TECHNOLOGICAL PROPERTIES
A. Martina, C. Folonari, and P. Bianco 1979 21 p refs Presented at Eurocoatings 79-European Conf. on Paints and Coatings, Rome, 25-26 Jun. 1979
Avail: NTIS HC A02/MF A01

The dependence of some mechanical and chemical/physical properties upon time and temperature variables in the process of curing leading to paint hardening is studied. The quantitative characterization of polymer crosslinking applied to whole paints is discussed. Experiments which determine the degree of crosslinking for a filler used in automobile production by noting the amount of swelling in the solvent, the permeability to water vapor, the tensile strength, and the elongation are described.
Author (ESA)

24 COMPOSITE MATERIALS

Includes laminates.

N80-22406*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF METHOD OF LOADING AND SPECIMEN CONFIGURATION ON COMPRESSIVE STRENGTH OF GRAPHITE/EPOXY COMPOSITE MATERIALS
Ronald K. Clark and W. Barry Lisagor Apr. 1980 44 p refs (NASA-TM-81796) Avail: NTIS HC A03/MF A01 CSCL 11D

Three test schemes were examined for testing graphite/epoxy (Narmco T300/5208) composite material specimens to failure in compression, including an adaptation of the IITRI 'wedge grip' compression fixture, a face-supported-compression fixture, and an end-loaded-coupon fixture. The effects of specimen size, specimen support arrangement and method of load transfer on compressive behavior of graphite/epoxy were investigated. Compressive stress strain, strength, and modulus data obtained with the three fixtures are presented with evaluations showing the effects of all test parameters, including fiber orientation. The IITRI fixture has the potential to provide good stress/strain data to failure for unidirectional and quasi-isotropic laminates. The face supported fixture was found to be the most desirable for testing [+ or - 45]s laminates.
A.R.H.

N80-22407*# Westinghouse Research and Development Center, Pittsburgh, Pa.
SILICONE MODIFIED RESINS FOR GRAPHITE FIBER LAMINATES Final Report
L. W. Frost and G. M. Bower 28 Sep. 1979 75 p refs (Contract NAS3-21373)
(NASA-CR-159750; FR-79-9b7-SICOP-R1) Avail: NTIS HC A04/MF A01 CSCL 11D

The development of silicon modified resins for graphite fiber laminates which will prevent the dispersal of graphite fibers when the composites are burned is discussed. Eighty-five silicone modified resins were synthesized and evaluated including unsaturated polyesters, thermosetting methacrylates, epoxies, polyimides, and phenolics. Neat resins were judged in terms of Si content, homogeneity, hardness, Char formation, and thermal stability. Char formation was estimated by thermogravimetry to 1,000 C in air and in N2. Thermal stability was evaluated by isothermal weight loss measurements for 200 hrs in air at three temperatures. Four silicone modified epoxies were selected for evaluation in unidirectional filament wound graphite laminates. Neat samples of these resins had 1,000 C char residues of 25 to 50%. The highest flexural values measured for the laminates were a strength of 140 kpsi and a modulus of 10 Mpsi. The highest interlaminar shear strength was 5.3 kpsi.
M.G.

N80-22408*# Little (Arthur D.), Inc., Cambridge, Mass.
AN ASSESSMENT OF THE RISKS PRESENTED BY CARBON FIBER COMPOSITES RELEASED FROM MOTOR VEHICLE FIRES
Donald B. Rosenfield, Joseph Fiksel, and Ashok S. Kalelkar Dec. 1979 87 p refs Sponsored in part by DOT
(Contract NAS1-15380)
(NASA-CR-159207; DOT-TSC-RSPA-80-4) Avail: NTIS HC A05/MF A01 CSCL 11D

A risk assessment was conducted to estimate the potential losses through 1993 due to the usage of carbon fiber (CF) composites in U.S. motor vehicles, including automobiles and trucks. Motor vehicle fires could conceivably release minute carbon fibers, which might disperse in the atmosphere, penetrate buildings or enclosures, and cause damaging shorts to electronic equipment. Of a total estimated 310,000 vehicle fires per year in the U.S., approximately 94,000 could potentially release carbon fibers. The average mass released was estimated to be about 20 grams per incident, based on forecasts, of CF usage through 1993 and experimental tests with burning CF composites. A methodology was developed to compute estimated dollar losses, incorporating data on the geographic distribution of potentially vulnerable facilities, as well as the mean CF exposure levels at which various equipment would fail. The results were then statistically aggregated to produce a national risk profile for estimated annual losses in 1993. The expected loss was $5,567 per year (1977 dollars), and the likelihood of exceeding $500,000 in annual losses was estimated to be at most one in ten thousand.
Author

N80-22409*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR TEMPERATURE DEPENDENT FAILURE ANALYSIS OF FINITE WIDTH COMPOSITE LAMINATES
Aniruddha P. Nagarkar and Carl T. Herakovich Dec. 1979 123 p
(Grant NsG-1250)
(NASA-CR-162868; VPI-E-79-36) Avail: NTIS HC A06/MF A01 CSCL 11D

A quasi-three dimensional, nonlinear elastic finite element stress analysis of finite width composite laminates including curing stresses is presented. Cross-ply, angle-ply, and two quasi-isotropic graphite/epoxy laminates are studied. Curing stresses are calculated using temperature dependent elastic properties that are input as percent retention curves, and stresses due to mechanical loading in the form of an axial strain are calculated using tangent modulii obtained by Ramberg-Osgood parameters. It is shown that curing stresses and stresses due to tensile loading are significant as edge effects in all types of laminate studies. The tensor polynomial failure criterion is used to predict the initiation of failure. The mode of failure is predicted by examining individual stress contributions to the tensor polynomial.
E.D.K.

N80-22410*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METHOD FOR MAKING PATTERNS FOR RESIN MATRIX COMPOSITES Patent Application
Manuel J. Fontes, inventor (to NASA) Filed 2 Apr. 1980 13 p
(NASA-Case-ARC-11246-1; US-Patent-Appl-SN-136660) Avail: NTIS HC A02/MF A01 CSCL 11D

A method for making laminate patterns for a resin matrix composite structural component is described. A sheet of paper is temporarily adhered to a model of the structural component. A tracer pen is positioned on the paper with an affixed spindle touching the model surface opposite the pen. The pen and spindle are moved along the path that maintains the aforementioned contacts. The resulting line traced on paper is a model constant thickness locus and provides a pattern for a single lamination of resin-impregnated fabric. The steps are repeated to make other patterns and each time the steps are repeated the distance between the tracer and the spindle is changed to correspond to the thickness of a lamination.
NASA

N80-22411*# National Aeronautics and Space Administration, Washington, D. C.
TESTING OF CONTAINERS MADE OF GLASS-FIBER

REINFORCED PLASTIC WITH THE AID OF ACOUSTIC EMISSION ANALYSIS

K. Wolitz, W. Brockmann, and T. Fischer Nov. 1979 11 p refs Transl. into ENGLISH from Neure entwicklungen und Besondere Verfahren der ZFP (Berlin), v. 3, 1978 p 789-795 Proceedings of the First European Conf. on Non-Destructive Testing, Mainz, West Germany, 24-26 Apr. 1978 Translation was announced as A79-30328 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75737) Avail: NTIS HC A02/MF A01 CSCL 11D

Acoustic emission analysis as a quasi-nondestructive test method makes it possible to differentiate clearly, in judging the total behavior of fiber-reinforced plastic composites, between critical failure modes (in the case of unidirectional composites fiber fractures) and non-critical failure modes (delamination processes or matrix fractures). A particular advantage is that, for varying pressure demands on the composites, the emitted acoustic pulses can be analyzed with regard to their amplitude distribution. In addition, definite indications as to how the damages occurred can be obtained from the time curves of the emitted acoustic pulses as well as from the particular frequency spectrum. Distinct analogies can be drawn between the various analytical methods with respect to whether the failure modes can be classified as critical or non-critical. A.R.H.

N80-22412*# National Aeronautics and Space Administration, Washington, D. C.

ECONOMICAL PROCESSING OF FIBER-REINFORCED COMPONENTS WITH THERMAL EXPANSION MOLDING

K. Schneider Dec. 1979 34 p Transl. into ENGLISH of conf. Paper-79-011 from DGLR Presented at the Symp. uber Wirtschaftliche Herstelltechniken, Cologne, 28 Mar. 1979 Original language document was announced as A79-32307 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3198)

(NASA-TM-75738; Paper-79-011) Avail: NTIS HC A03/MF A01 CSCL 11D

The concept of economical fabrication of fiber-reinforced structural components is illustrated with an example of a typical control surface (aileron). The concept provides for fabricating struts, ribs, and a cover plate as an integral structure in a hardening device and then joining the closure cover plate mechanically. Fabrication of the integral structure is achieved by the 'thermal expansion molding' technique. The hardening pressure is produced by silicone rubber cores which expand under the influence of temperature. Test results are presented for several rubber materials as well as for various structural pieces. The technique is demonstrated extensively for an aileron, consisting of five ribs, struts, and a cover plate. Economically, for a large scale technical production of an aileron, cost savings of twenty-five percent can be realized compared to those for a sheet metal structure. J.M.S.

N80-22413*# National Aeronautics and Space Administration, Washington, D. C.

ACOUSTIC EMISSION FROM COMPOSITE MATERIALS

I. C. Visconti and R. Teti Mar. 1979 31 p refs Transl. into ENGLISH of Conf. paper "Emissioni Acustiche dai Materiali Compositi", 1978 34 p Presented at the 3d Asmeccan. and Assoc. Meridionale di Meccan., Milan, 11-13 May 1978 Original language document was announced as A79-24063 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Napoli Univ.

(Contract NASw-3199)

(NASA-TM-75740) Avail: NTIS HC A03/MF A01 CSCL 11D

The two basic areas where the acoustic emission (AE) technique can be applied are materials research and the evaluation of structural reliability. This experimental method leads to a better understanding of fracture mechanisms and is an NDT technique particularly well suited for the study of propagating cracks. Experiments are described in which acoustic emissions were unambiguously correlated with microstructural fracture mechanisms. The advantages and limitations of the AE technique are noted. A.R.H.

N80-22414# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

EXPERIENCE FROM THE USE OF THE TRANSIENT MOISTURE RESPONSE COMPUTER PROGRAM WBGAIN FOR COMPOSITE MATERIALS

Christer Y. Lundemo Sep. 1979 69 p refs

(Contract FMV-F-K-82223-77-001-21-001)

(FFA-HU-2043) Avail: NTIS HC A04/MF A01

A computer program for transient moisture response of composite materials and the required input data are discussed. Some numerical results are presented and compared with experiments performed on graphite/epoxy T300/5208. The numerical results indicate that the weight-gain due to moisture could be well predicted when the input data are properly measured. There are large spreads in data presented in the literature between different investigations, probably due to different curing processes for the same material. It is suggested that the input data to a moisture response calculation must be measured in order to accurately predict the transient moisture response. Author (ESA)

N80-22415# National Technical Information Service, Springfield, Va.

CARBON AND GRAPHITE. PART 6: GLASSY CARBON. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1979

William E. Reed Dec. 1979 74 p Supersedes NTIS/PS-78/1055; NTIS/PS-77/0849; NTIS/PS-76/0690; NTIS/PS-75/618 and NTIS/PS-75/183

(PB80-802424; NTIS/PS-78/1055; NTIS/PS-77/0849; NTIS/PS-76/0690; NTIS/PS-75/618; NTIS/PS-75/183) Avail: NTIS HC $30.00/MF $30.00 CSCL 11B

The research reports describe glassy carbon preparation, structure, properties, composites and alloys with metals. This updated bibliography contains 68 abstracts, 8 of which are new entries to the previous edition. GRA

N80-22416# National Technical Information Service, Springfield, Va.

CARBON AND GRAPHITE. PART 5: CARBON RESEARCH. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1979

William E. Reed Dec. 1979 185 p Supersedes NTIS/PS-78/1054; NTIS/PS-77/0848; NTIS/PS-76/0689; NTIS/PS-75/617 and NTIS/PS-75/182

(PB80-802416; NTIS/PS-78/1054; NTIS/PS-77/0848; NTIS/PS-76/0689; NTIS/PS-75/617; NTIS/PS-75/182) Avail: NTIS HC $30.00/MF $30.00 CSCL 11B

The cited studies cover the use, physical and mechanical properties, production, and chemistry of various forms of carbon, such as carbon black, carbon foams, chars, coke, and activated carbon. This updated bibliography contains 180 abstracts, 17 of which are new entries to the previous edition. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N80-22417 Utah Univ., Salt Lake City.

DIRECT COUPLING OF A DENSE GAS CHROMATOGRAPH TO A MASS SPECTROMETER BY A SUPERSONIC MOLECULAR BEAM INTERFACE Ph.D. Thesis

Lenore Grace Randall Frank 1979 324 p

Avail: Univ. Microfilms Order No. 8008342

The dense gas chromatography/mass spectrometer (DGC/MS) coupling was accomplished by the use of supersonic molecular beam interface. Characteristices of supersonic jets and molecular beams pertinent to the design of such an instrument are discussed. This application of molecular beam formation appears to be unique in its requirements of a large pressure ratio (approximately 10 to the 8th power), low flow rates and

low final pressure. The interface which uses pumping speeds of 2400 l/sec and 12 l/sec in the beam forming chambers, the DGC, the detecting Perkin Elmer Model 270 mass spectrometer, and the improtant temperature control system are described.
Dissert. Abstr.

N80-22418 Northwestern Univ., Evanston, Ill.
VIBRATIONAL ENERGY TRANSFER IN POLYATOMIC GASES Ph.D. Thesis
Gordon Takeo Fujimoto 1979 151 p
Avail: Univ. Microfilms Order No. 8007374

Aspects of vibrational energy transfer in polyatomic gases. Vibrational deactivation (V-T/R) as well as inter and intramolecular collision induced vibrational energy transfer processes (V-V) are included. Emphasis is placed in two areas: vibrational energy processes in cyclopropane; and intramolecular vibrational energy transfer. It is shown that vibrationally excited molecules tend to have a smaller diffusion coefficient than ground state molecules. A treatment is presented which shows that the slower diffusion rate is due to the effect of intermolecular vibrational energy transfer. Dissert. Abstr.

N80-22419 Illinois Univ. at Urbana-Champaign.
ELECTRON PARAMAGNETIC RESONANCE STUDIES OF HEXAKIS(UREA)METAL(3)IODIDES Ph.D. Thesis
Milton Leverne Cofield 1979 140 p
Avail: Univ. Microfilms Order No. 8009005

Electron paramagnetic resonance spectra were recorded and analyzed for both pure crystals and solution spectra of the trivalent titanium ion in the hexakis(urea)metal(3)iodides. The results of these studies on the single crystals, polycrystalline materials and solution spectra indicate: (1) a high temperature spectrum derived from trivalent titanium ions in sites of orthorhombic symmetry present to the degree of a few percent in pure crystals at all temperatures in the range 2.8-85 K; and (2) a low temperature spectrum consistent with the predictions of the dynamic interaction from which data the range of coupling energy and excited state splittings may be ascertained. Dissert. Abstr.

N80-22420 Illinois Univ. at Urbana-Champaign.
ROTATIONAL SPECTROSCOPY OF MOLECULAR IONS Ph.D. Thesis
Leonard Edward Dude 1979 143 p
Avail: Univ. Microfilms Order No. 8009019

A method is described for the measurement of microwave rotational transitions of molecular ions. High resolution gas phase spectroscopy of molecualr ions is discussed. These are divided into two groups: (1) direct methods which measure the absorption of radiation by the ion; and (2) indirect methods (such as the technique described here) which measure the change in some other molecular parameter due to the absorption of radiation. Direct measurements of the rotational transitions in CO(+), HCO(+), and N2H(+), by radio astronomers and laboratory measurements are described. Several different types of indirect measurements are also discussed. Dissert. Abstr.

N80-22421 Oklahoma State Univ., Stillwater.
COAL DERIVED LIQUIDS HYDROTREATMENT-CATALYSTS DEACTIVATION STUDY Ph.D. Thesis
Mohammed Mushtaq Ahmed 1979 375 p
Avail: Univ. Microfilms Order No. 7928189

The hydrotreatment catalysts activity decay while processing coal derived liquids is assessed. Two Co-Mo-alumina catalysts and one Ni-Mo-alumina catalyst were tested. Experimental runs were conducted at 10,400 KPa (1500 psig) for temperatures in the range of 371 C to 454 C using four different coal derived liquids as feedstocks. A semimechanistic model has been developed to represent the data obtained in the study. Carbonaceous depositions seem to be the primary cause for catalyst activity decay. Inorganic depositions are also responsible for catalyst activity decay and can result in permanent deactivation due to a loss in surface area, pore volume, and dilution of the active species on the catalyst surface. Dissert. Abstr.

N80-22422 Utah Univ., Salt Lake City.
SOME X-RAY DIFFRACTION STUDIES OF HYDROGEN BONDING IN ORGANIC AND INORGANIC COMPOUNDS Ph.D. Thesis
Robert Jules Neustadt 1979 96 p
Avail: Univ. Microfilms Order No. 8008341

Bond shortening which can be interpreted as resulting from preferential stabilization of one resonance hybrid was investigated. This structure was solved by the heavy atom technique. A Patterson map was prepared and was used to locate the position of the bromine atoms in the unit cell of the crystal. This then provided information which resulted in phasing the observed structure factors. This compound has potential crystallographic use. It is an acidic phenol and in this sense similar to 2,4,6-trinitrophenol (picric acid). It forms easily crystallizable adducts with amines and at the same time introduces a heavy atom, which simplifies the structure determination. Dissert. Abstr.

N80-22423 Pennsylvania State Univ., University Park.
FACTORS INFLUENCING ROTATIONAL RAMAN INTENSITIES AT HIGH TEMPERATURE Ph.D. Thesis
Chamnong Asawaroengchai 1979 121 p
Avail: Univ. Microfilms Order No. 8005971

The method of analysis of measured rotational Raman peak-height intensities to obtain the rotational temperature of the scattering diatomic molecules is presented. A computer program is presented which determines rotational temperature from the measured peak-height intensities of rotational Raman transitions. Corrections by factors f(J) and eta(J) are included. The values of f(J) are calculated from the value of X of the scattering molecules. The value of eta(J) is determined by assuming the vibrational temperature and rotational temperature are the same, and the calculation of the temperature is carried out by an iterative process until the rotational temperature and vibrational temperature agree within 0.01 K. Dissert. Abstr.

N80-22424 Illinois Univ. at Urbana-Champaign.
LOW ENERGY SCATTERING IN AN ARGON AND METHANE SYSTEM Ph.D. Thesis
Leslie Neil Smith 1979 178 p
Avail: Univ. Microfilms Order No. 8009174

The theory for an argon-methane scattering system and several calculations in both the close coupling and coupled states schemes are presented. The problem is reduced to the irreducible A, E, and T representations and calculations in all these symmetries are performed and combined. Methane is treated as a rigid rotor. A total of two interaction potentials are employed and both contain an angle dependent term. Compound state resonances in this system are characterized. Close coupling and coupled states cross sections are compared in calculations with both interaction potential and in the A and E representations. Coupled states cross sections in all three representations are presented over a range of energies from 25-90 meV. Dissert. Abstr.

N80-22425 Oklahoma Univ., Oklahoma City.
DEVELOPMENT OF SMALL SCALE LIQUID IGNITION TESTS Ph.D. Thesis
Kou-Chu Yin 1979 181 p
Avail: Univ. Microfilms Order No. 8008667

An apparatus and an experimental procedure for small scale liquid flammability tests were developed. The N-tridecane, n-tetradecane and four mixtures of normal paraffins, from n-C12H26 to n-C15H32 were used to demonstrate the feasibility and effectiveness of the test apparatus. Both piloted and unpiloted ignition tests were conducted by using external radiant energy (heating source) supplied by tungsten filament lamps. The results indicate that the ignition times are primarily functions of incident irradiance (energy per unit area per unit time) for both piloted and unpiloted ignitions. As has been observed previously for the ignition of solids, the reciprocal of the ignition time for liquids also varies linearly with the incident irradiance; the minimum incident irradiance below which ignition did not occur (in infinite time) was found to be 0.06 cal/sq cm/sec for liquid n-tridecane and 0.078 cal/sq cm/sec for liquid n-tetradecane respectively. Other significant results are reported. Dissert. Abstr.

N80-22426 California Univ., Los Angeles.
THE ELECTROCHEMISTRY OF MOLTEN LITHIUM CHLORATE AND ITS POSSIBLE USE WITH LITHIUM IN A BATTERY Ph.D. Thesis
Su-Chee Simon Wang 1979 117 p
Avail: Univ. Microfilms Order No. 8008551

A rotating disk was used to investigate anodic and cathodic reactions occurring at positive electrodes in molten lithium chlorate cells. Three anodic plateaus, 2.9V, 3.4V, and 4.6V and one cathodic plateau at around 2.5V were observed for a Ni rotating disk. For a Pt rotating disk, three different anodic plateaus, at 3.4V, 4.2V, and 4.6V were observed while the cathodic curves were about the same as those obtained for Ni. Chemical analysis for Cl(-) ions and O(-2) ions was carried out. After anodic or cathodic polarization of a Ni or Pt electrode at controlled current or potential, the LiClO3 electrolyte was sampled, dissolved in water, and analyzed. Gas evolving from the positive electrode during anodic operation was also analyzed. Dissert. Abstr.

N80-22427 Illinois Univ. at Urbana-Champaign.
EFFECT OF GRAVITY ON LEAN LIMIT FLAME PROPAGATION Ph.D. Thesis
David Lee Reuss 1979 332 p
Avail: Univ. Microfilms Order No. 8009141

A literature survey was conducted in order to learn what has been accomplished in the past 100 years in determining and understanding the occurrence of flammability limits. The knowledge acquired in this survey was used to determine the best test procedure for studying the effect of gravity on lean flammability limits and to determine how the occurrence of the limit is modeled. Upward and downward lean limit methane-air flames were studied and photographed in a 50 mm diameter tube open at the ignition end and closed at the other. A laser Doppler anemometer was constructed and used to measure the axial velocity profiles of an upward propagating lean limit flame and of flames during extinction in sublean limit mixtures. Diffuse illumination holographic interferograms of an upward propagating lean limit flame and a post extinction hot bubble were made. Observations are reported. Dissert. Abstr.

N80-22428 Pennsylvania State Univ., University Park.
PREDICTION OF THERMOPHYSICAL PROPERTIES OF PETROLEUM FRACTIONS Ph.D. Thesis
Mohammad-Reza Riazi 1979 243 p
Avail: Univ. Microfilms Order No. 8006043

Thermophysical properties of a petroleum fraction were predicted using properties of pure compounds together with a molecular type analysis of the fraction. For light (molecular weight (M) < 200) olefin free fractions, a n-alkane, n-alkylcyclopentane, n-alkylbenzene(NP-NN-NA) model was developed which describes the structure of the fraction. Only boiling point as a characteristic parameter was needed to choose a pure compound from each hydrocarbon group. Molecular weight, critical temperature, critical pressure, critical volume, liquid molar volume, density, refractive index, heat of vaporization, and ideal gas heat capacity of petroleum fractions and pure compounds were simply correlated to the absolute boiling point and specific gravity at 60/60 F. When tested against data on pure compounds and petroleum fractions, these correlations were comparable with or superior to those obtained from previously recommended methods.
Dissert. Abstr.

N80-22429 Delaware Univ., Newark.
THE APPLICATION OF OPTIMAL ESTIMATION TO THE REAL TIME DIGITAL FILTERING OF ELECTROCHEMICAL WAVEFORMS Ph.D. Thesis
Paul Frederick Seelig 1978 321 p
Avail: Univ. Microfilms Order No. 7816912

An optimal recursive estimation technique known as the Kalman filter was implemented and evaluated for the real time (RT) analysis of voltammetric data. This RT technique was critically compared to non real time (NRT) and pseudo real time (PRT) algorithms for the analysis of data arising from four widely used electrometric methods of trace analysis. For synthetic data, synthetic aqueous analytes, and natural aqueous samples (sea water and tap water) a variety of NRT, RT, and PRT numerical algorithms were critically compared on the basis of the accuracy and precision of the concentration computed from the electrochemical current responses. It was found that in moderate to high signal to noise conditions (S/N>5) PRT algorithms yielded results comparable (at the 95 percent confidence level) to the NRT and RT Kalman filter methods. Other significant results are reported. Dissert. Abstr.

N80-22430*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ULTRALEAN COMBUSTION IN GENERAL AVIATION PISTON ENGINES
J. E. Chiriwella 1 Dec. 1979 246 p refs
(Contract NAS7-100)
(NASA-CR-163001; JPL-Pub-79-75) Avail: NTIS
HC A11/MF A01 CSCL 21B

The role of ultralean combustion in achieving fuel economy in general aviation piston engines was investigated. The aircraft internal combustion engine was reviewed with regard to general aviation requirements, engine thermodynamics and systems. Factors affecting fuel economy such as those connected with an ideal leanout to near the gasoline lean flammability limit (ultralean operation) were analyzed. A Lycoming T10-541E engine was tested in that program (both in the test cell and in flight). Test results indicate that hydrogen addition is not necessary to operate the engine ultralean. A 17 percent improvement in fuel economy was demonstrated in flight with the Beechcraft Duke B60 by simply leaning the engine at constant cruiser power and adjusting the ignition for best timing. No detonation was encountered, and a 25,000 ft ceiling was available. Engine roughness was shown to be the limiting factor in the leanout.
R.C.T.

N80-22431*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETONATION-FLAME ARRESTER DEVICES FOR GASOLINE CARGO VAPOR RECOVERY SYSTEMS Final Report
R. A. Bjorklund and P. R. Ryason Mar. 1980 245 p refs
Sponsored by NASA
(Contract Z70099-7-74328-H)
(NASA-CR-163009; JPL-Pub-80-18) Avail: NTIS
HC A11/MF A01 CSCL 21B

Empirical data on the deflagration-to-detonation run-up distance for flowing mixtures of gasoline and air in 15.2-cm-(6.0-in.-) diameter piping simulating a vapor recovery system are presented. The quenching capability of eight selected flame control devices subjected to repeated stable detonations was evaluated. The successful detonation-flame arresters were: (1) spiral-wound, crimped aluminum ribbon, (2) foamed nickel-chrome metal, (3) vertically packed bed of aluminum Ballast rings, and (4) water-trap or hydraulic back-pressure valve. Installation configurations for two of the more applicable arresters, the spiral-wound, crimped stainless-steel ribbon and the vertically packed bed of aluminum Ballast rings, were further optimized by a series of parametric tests. The final configuration of these two arresters was demonstrated with repeated detonation tests at conditions that simulated vapor recovery system operation. On these tests, the combustible mixture of gasoline and air continued to flow through the piping for periods up to 120 seconds after the initial detonation had been arrested. There was no indication of continuous burning or reignition occurring on either side of the test arresters. A.R.H.

N80-22432*# Little (Arthur D.), Inc., Cambridge, Mass.
ANALYSIS OF NASA JP-4 FIRE TESTS DATA AND DEVELOPMENT OF A SIMPLE FIRE MODEL
Phani Raj Apr. 1980 58 p refs
(Contract NAS1-15380)
(NASA-CR-159209; Rept-81857-6) Avail: NTIS
HC A04/MF A01 CSCL 21B

The temperature, velocity and species concentration data obtained during the NASA fire tests (3m, 7.5m and 15m diameter JP-4 fires) were analyzed. Utilizing the data analysis, a sample theoretical model was formulated to predict the temperature and velocity profiles in JP-4 fires. The theoretical model, which does not take into account the detailed chemistry of combustion, is capable of predicting the extent of necking of the fire near its base. Author

N80-22433# IBM Watson Research Center, Yorktown Heights, N.Y.
THE REACTION OF ACETYLENE WITH Ni(100) AND Ni (110) SURFACES AT ROOM TEMPERATURE
J. E. Demuth 1 Oct. 1979 32 p refs Submitted for publication
(Contract N00014-77-C-0366; NR Proj. 056-123)

(AD-A078630; TR-9) Avail: NTIS HC A03/MF A01 CSCL 07/4

Ultraviolet photoemission spectroscopy using Hv = 21.2eV and filtered 40.8eV radiation as well as temperature programmed thermal desorption spectroscopy are used to investigate the chemical reaction of acetylene with Ni(100) and Ni(110) surfaces at room temperature. Striking crystallographic effects and several coexisting phases are observed and found to be coverage and temperature dependent. A methodology is described to predict the relative energy levels for a variety of adsorbed hydrocarbon fragments on Ni surfaces. Such levels together with the thermal desorption spectra are used to identify the observed species. In particular, CH and CCH species are isolated on Ni(100) and Ni(110) surfaces, respectively via low temperature adsorption and subsequent pulsed sample warming experiments. The room temperature adsorption phases are deduced using these ionization levels together with those of chemisorbed acetylene, atomic hydrogen and carbon. At room temperature on Ni(100) H, C, CH and C2H2 species form together below 2 Langmuirs exposure while CH species form thereafter, up to saturation exposure of 10 Langmuirs. On Ni(110), H and CCH species form below 1.5 Langmuirs exposure followed by the formation of CH2 and likely CH species. The relative stabilities of these species at elevated temperatures is: C2H2-C2H-CH-CH2. A model for the bonding of acetylene and its reaction to form CCH species on Ni(110) is proposed. GRA

N80-22434# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.

LIQUID CHROMATOGRAPHIC ANALYSIS OF HYDRAULIC FLUIDS Final Report

Gary L. Hagnauer and Beverley M. Bowse Nov. 1979 48 p

(AD-A080386; AMMRC-TR-79-57) Avail: NTIS HC A03/MF A01 CSCL 07/4

High performance liquid chromatography (HPLC) is a versatile analytical technique for the separation and detection of components in complex chemical mixtures. HPLC test methods are developed to fingerprint the chemical compositions and to quantitatively analyze specific components in hydraulic fluids. Petroleum-base and synthetic hydrocarbon-base hydraulic fluids conforming to existing military specifications and used by the U.S. Army Materiel Development and Readiness Command are considered in this report. Detailed methods and test procedures are developed for the analysis of a MIL-H-6083D hydraulic fluid. The precision and accuracy of each method is evaluated. Suggestions are made regarding the implementation of the methods in military specifications, in field testing, and in the development of hydraulic fluids. GRA

N80-22435# Texas A&M Univ., College Station. Dept. of Chemistry.

SOME NEW DEVELOPMENTS IN CHEMISTRY OF METALLOPHTHALOCYANINES Interim Report

Minoru Tsutsui (Shimane Univ., Matsue, Japan) and Kuninobu Kasuga Jan. 1980 53 p refs

(Contract N00014-75-C-0417)

(AD-A080205; TR-31) Avail: NTIS HC A04/MF A01 CSCL 07/3

Like many of the great moments in science, the chemistry of phthalocyanine and metallophthalocyanines began by an accidental discovery. In 1907, Braun and Tcherniac heated an alcoholic solution of o-cyanobenzamide in order to study some of its properties. After cooling, small amounts of a blue compound precipitated. The precipitate turned out to be phthalocyanine. This was the first time phthalocyanine was synthesized. In 1927, de Diesbach and von der Weid attempted to prepare o-xylenedicyanide from a mixture of o-dibromobenzene and cuprous cyanide by heating in pyridine at 200 C. However, they obtained a blue compound containing copper. Later this blue compound was identified as copper(2)-phthalocyanine. Thus, the preparation of the first metallophthalocyanine was also an accident. In the early 1930's, Linstead and his co-workers synthesized many metallophthalocyanines and reported that a phthalocyanine ligand consists of four units of isoindole and has a highly conjugated system. In 1933, for the first time, he used the term 'phthalocyanine', which comes from the Greek naphtha (rock oil) and cyanide (dark blue). Later Robertson et al., elucidatnd the structures of phthalocyanine and nickel(2), copper(2), and platinum(2) phthalocyanines using single crystal X-ray diffraction analysis. Since that time, many studies have been done on semiconductivity, photoconductivity, photochemical reactivity, photosynthetic activity, luminescence, and fluorescence which are based on the highly conjugated system of phthalocyanine and metallophthalocyanines. GRA

N80-22436# Texas A&M Univ., College Station. Dept. of Chemistry.

ELECTRON TRANSFER REACTIVITY ON NOVEL DIRHENIUM AND DIRHODIUM TETRAAZAANNULENE COMPLEXES Interim Report

Minoru Tsutsui, Rex Bobsein, K. M. Kadish, L. A. Bottomley, and D. Schaeper Jan. 1980 15 p refs

(Contract N00014-75-C-0417; NR Proj. 053-559)

(AD-A080181; TR-32) Avail: NTIS HC A02/MF A01 CSCL 07/4

The electron transfer reactivities of dirhenium and dirhodium carbonyl complexes of the macrocyclic ligans, 5,7,12,14-tetramethyldibenz o (b,i)(1,4,8,11) tetraaaz (14) annulene, (TMTAA), dibezo (b, i) (1,4,8,11) tetraaza (14) annulene, (TAA), and tetraphenylporphyrin, (TPP) were investigated by cyclic voltammetry and differential pulse polarography. Potentials are reported for the electrochemcial generation of pi cation and pi anion radicals of these complexes in the solvents dichloromethane and dimethylformamide. The potential differences between the pi radical reactions of the metallomacrocyclic complexes were compared to the potential differences of the pi radical reactions of the free macrocycles. GRA

N80-22437# Colorado Univ. at Boulder. Dept. of Chemistry.

STUDIES OF NEW CHEMICAL ANALYSIS TECHNIQUES Final Report, 1 Sep. 1975 - 30 Sep. 1979

Robert E. Sievers 1979 11 p refs

(Contract F44620-76-C-0031)

(AD-A080203; AFOSR-80-0020TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

Results are reported from a trace level analysis research program enveloping volatile metal chelate chemistry, gas chromatography, and environmental analysis. The overall thrust of the program was to develop sensitive and selective analytical techniques for a variety of samples. The methods employed involved various combinations of sample collection and concentration, derivatization and separation, and, finally, detection. Examples of the measurements considered include molybdenum and aluminum by a metal chelate derivatization/atomic absorption spectrophotometric technique, polynuclear aromatic hydrocarbon concentration on open-pore polyurethane (OPP) followed by liquid chromatographic analysis, herbicide separation on OPP columns, and nitrate ion and nitrogen oxide analysis by a derivatization/electron capture technique. A metal chelate containing material has been synthesized for use as a selective sorbent. The usefulness of the electron capture detector has been advanced by the addition of nitrous oxide to the carrier gas. With this technique, Selective Electron Capture Sensitization (SECS), additional sensitivity has been found for many compounds which normally are not detected by the electron capture detector. GRA

N80-22438# Defence Research Establishment Suffield, Ralston (Alberta).

PHYSICAL PROPERTIES OF A THICKENED SOLVENT

C. L. Chenier and G. A. Hill Jan. 1979 57 p

(AD-A064306; DRES-TN-435) Avail: NTIS HC A04/MF A01 CSCL 07/3

The density, vapor pressure, surface tension and viscosity of thickened Dowanol, DPM, were measured experimentally according to standard techniques. Each of the techniques is explained in detail and a brief summary of the theory is also presented. A new parameter called the 'dissolved density' was defined which promises to allow differentiation between thickening polymers. The addition of an acrylate polymer had no effect on the surface tension or vapor pressure of the solvent. The effect of thickener concentration on viscosity was determined over a range of shear rates where the thickened solutions were found to follow the power-law fluid model. GRA

N80-22439# Defence Research Establishment, Ottawa. (Ontario).

ELECTROCATALYSIS STUDIES OF TRANSITION-METAL SILICIDES

David T. Fouchard and Christopher L. Gardner Dec. 1978 36 p refs In ENGLISH; FRENCH summary
(AD-A064205; DREO-793) Avail: NTIS HC A03/MF A01 CSCL 07/4

A series of transition metal silicides were evaluated as catalysts for the anodic oxidation of hydrogen in acid medium. Overall levels of activity were very low and relative levels of activity were very similar for all the compounds except CR3 SI which showed an activity roughly three times the others. Each of the compounds formed highly irreversible passive films when polarized anodically making them quite stable in acid medium. The usefulness of the compounds as catalyst support materials, however, is hindered by difficulties in obtaining efficient electrodeposition of active metals onto the compounds. The study also revealed that erroneous results can easily be obtained in electrocatalysis studies if care is not taken to exclude all traces of platinum from the test cell as platinum was found to migrate about the cell when platinum counter electrodes were used. GRA

N80-22440# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
THE EFFECT OF HALON 1301 FIRE EXTINGUISHING AGENT ON THE RESPONSE OF COMBUSTIBLE GAS INDICATORS Final Report
W. A. Affens 18 Jan. 1980 20 p refs
(NRL Proj. C05-19)
(AD-A080529; AD-E000363; NRL-MR-4150) Avail: NTIS HC A02/MF A01 CSCL 13/12

A combustible gas indicator (CGI) was tested in combustible vapor-air mixtures with and without the presence of halon 1301 vapors. CGI response to hydrocarbon vapors was reduced on the average of about 30 percent in the presence of halon 1301 vapors at fire extinguishment concentrations for hydrocarbon type fires (3.7 percent) and about 45 percent at inerting concentrations (7.4 percent). Some filament deterioration was noted in filaments which were exposed to halon vapors. Sensitivity loss for these filaments averaged about 9 percent. GRA

N80-22441# IIT Research Inst., Chicago, Ill.
IDENTIFICATION OF REACTION INTERMEDIATES IN COMBUSTION REACTIONS INVOLVING HALOCARBON FLAME RETARDANTS Final Report
Alan Snelson and R. Butler 31 Dec. 1979 77 p refs
(Contract DAAG29-76-C-0038)
(AD-A080618; IITRI-C6372; ARO-14053.1-CX) Avail: NTIS HC A05/MF A01 CSCL 21/2

The pyrolysis of some perfluoro organic iodides have been used to prepare free radical species, of possible importance in flame inhibition chemistry, for infrared matrix isolation studies. The species CF3O2, C2F5, n-C3F7 and iso-C3F7 were identified and vibrational assignments made. For CF3O2, oxygen isotope studies were used to help in the vibrational assignments. Papers for publication have been prepared describing this work and are included in this report. Normal coordinate analyses for CF3O2 and C2F5 are currently in progress and will be submitted for publication in 1980. Preliminary data from these calculations strongly support the initial vibrational assignments made for CF3O2 and C2F5. Attempts were made to identify the species CF3O, t-C4F9, C6F5 and C6F5O2. Some evidence for the existence of CF3O was found but was not definitive. The results of these latter studies are described in the first section of this report. GRA

N80-22442# IRT Corp., San Diego, Calif.
TRANSITION STATE THEORY AND THE COMPENSATION EFFECT IN CHEMICAL KINETICS
Robert L. Palmer 4 Feb. 1980 12 p refs Submitted for publication
(Contract N00014-77-C-0255; NR Proj. 056-527)
(AD-A080988; IRT-8162-004; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

Detailed balancing is applied to transition state theory with the result that the necessity of a compensation law relating the pre-exponential factor and the energy in chemical kinetics is clearly established. It is pointed out that the correct compensation behavior is achieved if the volume change that enters into the Clapeyron equation is taken to mean the volume change in phase space. GRA

N80-22443# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MOLECULAR BEAM SURFACE SCATTERING: THE DECOMPOSITION OF AMMONIA ON SINGLE CRYSTAL PLATINUM SURFACES M.S. Thesis
Jonathan Daniel Sokol Aug. 1979 107 p refs
(Contract W-7405-eng-48)
(LBL-9712) Avail: NTIS HC A06/MF A01

The interaction of ammonia with single crystal platinum surfaces is discussed. The adsorption/desorption processes, as well as the decomposition reaction using molecular beam scattering, and the reaction mechanisms and kinetics are included. Also described is a method for measuring system pumping speeds using molecular beams. DOE

N80-22444# Sandia Labs., Livermore, Calif.
FUNDAMENTAL COMBUSTION AND DIAGNOSTICS RESEARCH AT SANDIA Progress Report, Apr. - Jun. 1979
M. A. Businow, ed. Aug. 1979 27 p refs
(Contracts EY-76-C-04-0789)
(SAND-79-8256) Avail: NTIS HC A03/MF A01

Several projects addressing aspects of combustion physics are briefly described. A quasi-classical trajectory, quantum mechanical threshold method is in excellent agreement with experiment for the H + O2 yields OH + O reaction. A theoretical model is developed for the selective reduction of NO by NH3. An experimental study of NH3-O2 flames is described. Probability of ignition and extinction of a CH4/air diffusion flame by a laser spark was measured vs spark-flame distance. Work on correlation functions in evaluating the normal mode approximation in combustion is reported. Data are presented which show that the j-dependence of Raman linewidths for N2 Q-branch is significant at both room and high temperatures for high J values. The coherent anti-Stokes Raman spectra of N2 hot bands were measured and found to fit the calculated spectrum. Stokes scattering from N2 was studied in different regions of a CH4 air flame. DOE

N80-22445# California Univ., Berkeley. Lawrence Berkeley Lab.
FLAME STRUCTURE MEASUREMENT OF POLYMER DIFFUSION FLAMES
W. J. Pitz, W. J. Brown, and R. F. Sawyer Oct. 1979 29 p refs Presented at Combustion Inst. Western States Sect. Meeting, Berkeley, Calif., 15 Oct. 1979
(Contract W-7405-eng-48)
(LBL-9567; CONF-791048-3) Avail: NTIS HC A03/MF A01

Flame structure measurements of polyethylene/opposed flow diffusion flames, obtained under steady-state conditions as extinction was approached, are discussed. The CO/CO2 ratio increases slightly as extinction is approached. Carbon monoxide significantly penetrates the luminous flame zone which is a departure from the flame sheet approximation. The composition profiles are similar within experimental error, thus justifying the use of the similarity assumption for modeling studies in the opposed flow configuration. DOE

N80-22446# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.
INFORMATION ON MEMBRANES DERIVED FROM ELECTRICAL SURFACE CHARGE MEASUREMENTS
Tom S. Tenforde May 1979 11 p
(Contract W-7405-eng-48)
(LBL-10057) Avail: NTIS HC A02/MF A01

The characterization of changes that occur in the surface properties of cultured fibroblastic cells when they are transformed by an oncogenic virus was studied, specifically, those changes in cell surface macromoles and the cellular biochemical mechanisms which create these changes. The microscope method of electrophoresis was used. The results indicate that transformation leads to a reduced content of acidic glycoproteins at the surface of mouse fibroblasts, and that this biochemial alteration may be a consequence of a depression in the intracellular level of cAMP. DOE

N80-22447# California Univ., Berkeley. Lawrence Berkeley Lab.
VIBRATIONAL ENERGY TRANSFER IN GAS PHASE WATER AND AMMONIA Ph.D. Thesis
F. E. Hovis, Jr. Sep. 1979 118 p refs
(Contract W-7405-eng-48)
(LBL-9955) Avail: NTIS HC A06/MF A01

The vibration to translation and rotation relaxation rate for NH3 was studied from 198 K to 398 K by the method of laser excited vibrational fluorescence. The self-deactivation rate constant decreases were calculated and compared to the rate constants for deactivation by He, Ar, N2, and O2. The temperature dependence of the deactivation is discussed. DOE

N80-22448# Los Alamos Scientific Lab., N. Mex.
FLOWING AFTERFLOW SPECTROSCOPY: AN ULTRASENSITIVE PROBE INTO SOLID-PHASE DECOMPOSITION KINETICS
G. W. Taylor and G. H. Andrews, Jr. 1979 30 p refs Presented at 5th Symp. on Chem. Probl. Connected with the Stability of Explosives, Bostod, Sweden, May 1979
(Contract W-7405-eng-36)
(LA-UR-79-3257; CONF-7905125-1) Avail: NTIS HC A03/MF A01

The thermal decomposition kinetics of high explosives are examined and a method to test the thermal stability of explosives is proposed. The flowing afterglow method which utilizes small explosive samples and an ultrasensitive analytical approach is the method discussed. The technique is described and efforts to elucidate the low-temperature kinetics of trinitrotriaminobenzene and nitroguanidine are discussed. DOE

N80-22449# European Space Agency, Paris (France).
STABILIZATION OF FLAME IN A RAMJET COMBUSTOR BY MEANS OF A PILOT GAS GENERATOR
Egbert Riester Dec. 1978 61 p refs Transl. into ENGLISH of "Flammenstabilisierung in Staustrahl-Brennkammern durch einen Pilot-Gasgenerator", Rept. DLR-FB-77-54 DFVLR, Brunswick, Nov. 1977 Original report in GERMAN previously announced as X79-72011
(ESA-TT-511-Rev; DLR-FB-77-54) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 28,20

The use of a pilot gas generator to shift the flameout limit in a ramjet combustion chamber toward a higher excess of air was investigated. Flame stabilization in ramjet combustion chambers is difficult, because of the high combustion-chamber inlet velocity and the low temperatures. Often, the flameout limit for lean mixtures is only slightly removed from the stoichiometric mixing ratio. The velocity curves were determined in a typical ramjet combustion chamber system. The lean-mixture flameout limits were measured, first without and then with a pilot gas generator, and compared. A small stoichiometrically-operating propane-oxygen burner is used as the pilot gas generator.
Author (ESA)

N80-22450# European Space Agency, Paris (France).
INFLUENCE OF GRAVITY ON CHEMICAL VAPOR DEPOSITION PROCESSES
Georg Wahl, Julius J. Nickl, and Wolfgang Just Jan. 1980 70 p refs Transl. into ENGLISH of "Einfluesse der Schwerkraft bei der Beschichtung nach dem CVD-Verfahren", Rept. BMFT-FB-W-77-41 DFVLR, Cologne and Brown, Boveri und Cie, A.G. Heidelberg
(ESA-TT-544; BMFT-FB-W-77-41) Avail: NTIS HC A04/MF A01; ZLDI, Munich DM 17,45

The effect of gravity on the chemical vapor deposition process is described as twofold: it affects the convection in the stationary case, and it creates instabilities. The hydrodynamic theory of chemical vapor deposition process is described. Theoretical results are compared with deposition experiments (SiO_2, Si_3N_4 deposition) and with fume experiments. In order to investigate experimentally the influence of gravity on the crystal structure, Si epitaxy experiments are proposed. The experimental arrangement necessary for these experiments is described and tested for TiN deposition experiments. Author (ESA)

N80-22451# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
LIQUID-VAPOR SATURATION DENSITY DATA
Dirk Rathmann, Daniel A. Sullivan, and Philip A. Thompson Mar. 1979 75 p
(MPIS-8/1979) Avail: NTIS HC A04/MF A01; Fachinformationszentrum Karlsruhe, West Germany DM 14,10

Tables are presented for 72 gases and liquids. The values of the tables and the first critical data set correspond to the first cited reference on each page. The second critical data set refers to the authors' given as second (and third) citation. Most of the values given in the tables were reduced using the first critical data set. Author (ESA)

N80-22452# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
FUNDAMENTAL STUDIES OF DESALINATION BY FREEZING Final Report
Kenneth A. Smith and Adel F. Sarofim Jan. 1979 75 p refs
(Contract DI-14-20-3268)
(PB80-124316; W80-02155; OWRT-3268(1)) Avail: NTIS HC A04/MF A01 CSCL 07D

Studies on a pilot-scale crystallizer were used to determine the subcooling of the brine solution, the particle size distribution and the permeability of the ice product in a 6% by weight brine solution for various ice production rates, agitation power, and ice concentration. These data were used to generate ice crystal growth rates and nucleation rates to compare with generalized correlations developed for ice growth and nucleation. By application of population balance mathematics to a well-stirred continuous crystallizer, a quantitative relationship between ice particle size and ice production rate was developed. The growth kinetic parameters needed for application of the resulting relations were determined from a systematic study of the mass transfer to discs, spheres, and cylinders suspended in a turbulent agitated fluid. The results could be represented by a single correlation between the Sherwood number, the Schmidt number, and the Kolmogoroff power number, for a range of impeller designs and types, vessel aspect ratios, and impeller-to-vessel dimensions. Correlations for ice nucleation kinetics were determined from batch crystallizer studies for a wide range of salt concentration, solution subcooling, and agitation power. GRA

N80-22453# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 84, NO. 4 Bimonthly Report, Jul. - Aug. 1979
1979 77 p refs
(PB80-124548; LC-62-37059) Avail: NTIS HC A05/MF A01 CSCL 07D

A series of papers are presented addressing disciplines of physical and engineering sciences. These include physics, chemistry, engineering, mathematics, and computer sciences. Major emphasis is placed on measurement methodology and the basic technology underlying standardization. Survey articles on topics closely related to technical and scientific programs are also presented. GRA

N80-22454# California Univ., Riverside. Statewide Air Pollution Research Center.
OXIDANT-PRECURSORS RELATIONSHIPS Final Report
Edgar R. Stephens and Oscar P. Hellrich Aug. 1979 74 p refs
(Grant EPA-R-803799)
(PB80-122278; EPA-600/3-79-076) Avail: NTIS HC A04/MF A01 CSCL 07D

New methods of ambient air analysis were used to define more clearly the relationships between oxidants and their precursors. Non-methane hydrocarbons, NOx, O2, and oxidants were measured at the same time and location (Riverside, California). The ambient air data presented are displayed as a series of conditional joint distributions. The correlations range from excellent ozone vs oxidant to poor or bimodal ozone with nonmethane-ethane organics (NMEO) or with NOx. The ratio of NMEO to NOx was always higher than indicated by inventories and showed a large scatter. No depletion of NMEO with respect to acetylene could be detected. GRA

N80-22455# TRW Defense and Space Systems Group, Redondo Beach, Calif.

CHEMICAL ANALYSIS OF WET SCRUBBERS UTILIZING ION CHROMATOGRAPHY Final Report, Sep. 1977 - Sep. 1978
Tobias R. Acciani and Ray F. Maddalone Jul. 1979 63 p refs
(Contract EPA-68-02-2165)
(PB80-124332; EPA-600/7-79-151) Avail: NTIS HC A04/MF A01 CSCL 07D

The elements required to develop a sampling and analysis program for a wet scrubber using ion chromatography as the analytical technique are examined. A sampling program for two different types of wet scrubbers: the venturi/spray tower (limestone) scrubber and the dual alkali pilot scrubber is described. The scrubber type, sample collection, and sample preservation are discussed. The theory and practice of ion chromatography as applied to wet scrubber samples are summarized. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-22456 Ohio State Univ., Columbus.
INITIAL HYDROGEN ATTACK KINETICS IN A CARBON STEEL Ph.D. Thesis
Marvin Grendel McKimpson 1979 159 p
Avail: Univ. Microfilms Order No. 8009312

The kinetics of the initial stages of hydrogen attack in a commercial 0.3% C steel (grade A516) were investigated using an in situ dilatometer. The time, temperature and hydrogen pressure dependences of the rate of sample expansion were measured at hydrogen pressures from 1 to 20 MPa and temperatures from 350 C to 475 C. Hydrogen attack induced sample expansion was observed to begin shortly after hydrogen exposure and then to proceed at a nearly constant rate throughout the incubation period preceding rapid attack. Results indicate that bubble growth during the incubation period occurs predominantly by grain boundary diffusion and suggest that this growth is driven by near-equilibrium internal methane pressures. Sample expansion in the subsequent stages of accelerating growth studied by various investigators probably is controlled by creep and methane generation. Dissert. Abstr.

N80-22457 Ohio State Univ., Columbus.
OXIDATION AND CARBURIZATION OF Fe-Cr AND Ni-Cr ALLOYS AT 850 AND 950 C IN CO/CO2 GAS MIXTURES Ph.D. Thesis
Jeffrey Alan Colwell 1979 255 p
Avail: Univ. Microfilms Order No. 8009268

Isothermal stability diagrams were used to predict the onset of carburization in various alloys exposed to the gas mixtures. A zirconia oxygen gauge was used to measure the oxygen activity and, therefore, the CO2/CO ratio, during an experiment. The carbide morphology generally consisted of a denuded zone between oxides (either as an external scale or internal precipitates) and carbides. An explanation based on ternary thermodynamic interaction effects is discussed. The transition from internal oxidation to external scaling in these CO/CO2 gases is between 15 and 20 wt.% Cr in the Fe-Cr alloys. Scanning electron microscopy was used to observe the surface oxide morphology. In most gas mixtures iron (Fe-Cr alloys) or nickel (Ni-Cr alloys) remained noble, relative to oxide formation. In these cases, pure iron or pure nickel crystals were present on the surface. Also, rumpled FeCr2O4 scales were identified on the surface of some Fe-Cr alloys. Dissert. Abstr.

N80-22458 Ohio State Univ., Columbus.
A STUDY OF THE INTERRELATIONSHIPS AMONG WEAR, FRICTION AND MICROSTRUCTURE IN THE UNLUBRICATED SLIDING OF COPPER AND SEVERAL SINGLE-PHASE BINARY COPPER ALLOYS Ph.D. Thesis
Peter Julian Blau 1979 360 p
Avail: Univ. Microfilms Order No. 8008769

Two sliding geometries were used for testing in low humidity (20 - 35% RH) environments: a block-on-ring configuration using 440 C stainless steel rings, and a pin-or-disk configuration using 52100 ball bearings for the tips of the rider pins. Low sliding velocities were used to minimize frictional heating (5.0 cm/sec for most tests). Emphasis was placed on understanding the nature of sliding-induced metal deformation in near surface regions. Experimental results were considered in light of recent models for wear and friction based on the role of stacking fault energy in determining modes of plastic deformation. A qualitative model for the deterioration of wear surfaces is proposed. Two possible mechanisms are suggested for the formation of thin, copper colored films on wear tracks on Cu - Al disks. Dissert. Abstr.

N80-22459 Pennsylvania Univ., Philadelphia.
A THEORY OF ALLOY FORMATION Ph.D. Thesis
Robert Michael Visnov 1979 190 p
Avail: Univ. Microfilms Order No. 8009474

A theory is presented designed to provide an expression for the heat of formation of an alloy which is rigorous to a certain order, flexible enough to treat other associated problems, and physically reasonable in the sense that its relation to the physical processes of alloy formation is clear. The resulting expression is the sum of several terms, including: the elastic energy of expansion or compression of the pure constituents to their alloy volume; a short range intercell electrochemical energy due to the transfer of charge between neighboring cells; and a long range Coulombic energy with a Madelung form which arises because of the net charge within atomic cells after charge transfer. Other energies, such as those due to the nonsphericity of the cells and the intercell exchange-correlation interaction are neglected.
Dissert. Abstr.

N80-22460 Ohio State Univ., Columbus.
A STUDY OF CORROSION FATIGUE CRACK PROPAGATION OF 403 STAINLESS STEEL IN AQUEOUS ENVIRONMENTS Ph.D. Thesis
Lillian Abrego 1979 205 p
Avail: Univ. Microfilms Order No. 8008753

Cyclic crack growth rates were measured as a function of stress intensity range using compact tension specimens. The material investigated was 403 stainless steel in the quenched and tempered condition. Crack growth studies were conducted in laboratory air, water, sodium chloride, sodium sulfate, sodium phosphate, and sodium silicate solutions. The tests were performed at 25 and 100 C with the pH varied from 2 to 10. All tests were performed at a constant stress ratio with a sinusoidal wave form. In air, water and sodium chloride, crack growth rates were determined for a range of loading frequencies. The stress intensity threshold ranges was determined in air, water, sodium chloride, sodium sulfate, and sodium phosphate. Fractography was conducted with a scanning electron microscope on samples from each test condition. Significant results are reported.
Dissert. Abstr.

N80-22461 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE PRECIPITATION SEQUENCE OF METASTABLE TETRAGONAL PHASES IN METALLIC SOLID SOLUTIONS Ph.D. Thesis
Roberto J. Rioja 1979 165 p
Avail: Univ. Microfilms Order No. 8003409

The precipitation sequence in three binary alloys has been investigated by means of transmission electron microscopy and differential scanning calorimetry. The alloys investigated were A1-4w/oCu, Cu-2w/oBe and Ni-(16-19)a/oV. These alloys exhibit similar features during the early stages of phase separation. Calorimetric analysis revealed the presence of endothermic reactions associated with the dissolution of the different phases encountered. The solvus temperature is shown to be dependent upon the size of the dissolving precipitates. Dissert. Abstr.

N80-22462 Illinois Univ. at Urbana-Champaign.
EXPERIMENTAL AND THEORETICAL MODELING STUDIES OF THE INITIATION OF CREVICE CORROSION Ph.D. Thesis
David William Siitari 1979 205 p
Avail: Univ. Microfilms Order No. 8009169

A theoretical model which accounted for transport and reaction processes within a corroding crevice was developed. The systems exhibited realistic crevice corrosion behavior. The results and theoretical predictions were compared in detailed

manner. Crevices were formed between the ends of two cylinders and spacings as small as 0.015 mm were studied. The transient current distribution within crevices was measured by means of a sectioned electrode technique and the electrode potential and pH were also continuously monitored. Experiments were performed with potentiostatic control and also under conditions of natural immersion. In contrast to previous experimental studies, the initial conditions at the moment of crevice formation were well defined. This enabled more rigorous mathematical descriptions to be formulated. Dissert. Abstr.

N80-22463 Polytechnic Inst. of New York.
LASER INDUCED DIELECTRIC BREAKDOWN OF THE METAL CARBONYLS Ph.D. Thesis
Yedidyah Langsam 1979 177 p
Avail: Univ. Microfilms Order No. 8006669

The method of laser induced dielectric breakdown was used to study the dissociation of the metal carbonyls. Following nonresonant excitation by a TEA CO2 laser, amorphous micrometallic particles were deposited. Laser induced dielectric breakdown was examined in terms of its origin, and the nature of the ensuing plasma state was investigated. Based upon the energetics of dissociation and the relative magnitudes of the rates of activation and deactivation for various collision partners of the plasma fluorescence, an energy transfer map as well as probable mechanisms were proposed. Using an optical multichannel analyzer, the identity of the various species within a laser induced plasma for a series of related reactant molecules was determined. Particle morphology was ascertained using a variety of physicochemical techniques. Dissert. Abstr.

N80-22464*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF YTTRIUM, ALUMINUM AND CHROMIUM CONCENTRATIONS IN BOND COATINGS ON THE PERFORMANCE OF ZIRCONIA-YTTRIA THERMAL BARRIERS
Stephan Stecura 1980 12 p refs Presented at Intern. Conf. on Metallurgical Coatings, San Diego, Calif., 21-25 Apr. 1980
(NASA-TM-81485; E-423) Avail: NTIS HC A02/MF A01 CSCL 11F

A cyclic furnace study was conducted on thermal barrier systems to evaluate the effects of yttrium, chromium, and aluminum in nickel-base alloy bond coatings and the effect of bond coating thickness on yttria-stabilized zirconia thermal barrier coating life. Without yttrium in the bond coatings, the zirconia coatings failed very rapidly. Increasing chromium and aluminum in the Ni-Cr-Al-Y bond coatings increased total coating life. This effect was not as great as that due to yttrium. Increased bond coat thickness was also found to increase life. Author

N80-22465*# National Aeronautics and Space Administration, Washington, D. C.
THEORY OF PLASTIC FLOW IN A THIN LAYER OF METAL
I. A. Kiyko May 1980 132 p refs Transl. into ENGLISH of Sci. Proc. no. 15 (Moscow), 1971 65 p Transl. by Agence Tunisienne de Public-Relations, Tunis Original doc. prepared by Moscow State Univ., USSR
(Contract NSF C-504)
(NASA-TT-F-17154) Avail: NTIS HC A07/MF A01 CSCL 11F

Analytical methods of investigation of the processes of plastic flow in a thin layer of metal inserted between the working surfaces of an instrument's part are dealt with. Approximation methods for solving concrete problems are proposed. The theoretical possibilities for the design of an instrument able to compensate in the flow process for the inaccuracy of a detail fabrication due to the finite rigidity of the instrument are analyzed. The flow processes under heat exchange conditions when the initial temperatures of the layer differ substantially from that of the instrument's parts are investigated. E.D.K.

N80-22466*# Iowa Univ., Iowa City. Div. of Materials Engineering.
ANALYSIS OF TEST SYSTEM MISALIGNMENT IN THE CREEP TEST
Han C. Wu and T. P. Wang 15 Apr. 1980 40 p refs
(Grant NsG-1499)
(NASA-CR-162924; G302-80-002) Avail: NTIS HC A03/MF A01

Sheet type rectangular 1100-0 aluminum specimens were tested. The creep strain at the geometric centerline of the specimen is different than that at the neutral axis, and decreases with time. The effect of misalignment, which decreases with creep time, is minimized when creep tests are conducted with long pullrods and large initial strain level (high creep stress). E.D.K.

N80-22467# Technion - Israel Inst. of Tech., Haifa. Dept. of Materials Engineering.
SUPERSATURATED ALUMINUM ALLOY POWDERS Final Scientific Report, 1 Oct. 1978 - 31 Sep. 1979
Dan Shechtman Nov. 1979 12 p refs
(Grant AF-AFOSR-3696-78; AF Proj. 2301)
(AD-A080193; EOARD-TR-80-6) Avail: NTIS HC A02/MF A01 CSCL 11/6

Four aluminum alloys were prepared as powders by the RSR Process. The compositions (in weight percents) were: (1) AL-7Fe-0.5Cr; (2) AL-7Fe-1.0Cr; (3) AL-7Fe-1.5CR; (4) AL-7Fe-1.0CR-0.2Ti-0.2v-0.2Zr. The alloys were compacted and extruded at 750 F with an extrusion ratio of 39.3 1. Microstructural investigations of both the powders and the bulk extrusion were made. GRA

N80-22468# Pennsylvania State Univ., University Park. Applied Research Lab.
HOT CORROSION AND OXIDATION STUDIES OF COBALT BASED SUPERALLOYS AT 1000 C M.S. Thesis
Gregory A. Dries Oct. 1979 260 p refs
(Contract N00024-79-C-6043)
(AD-A080163; ARL/PSU-TM-79-177) Avail: NTIS HC A12/MF A01 CSCL 11/6

Recently, the trend in superalloy design has been aimed toward the development of alloys which are resistant to the harmful effects of sodium sulfate formed within gas turbines operated in marine environments. This phenomenon, commonly referred to as hot corrosion, has been extensively studied. These studies have elucidated the mechanism of sodium sulfate attack and have led to the development of alloys resistant to hot corrosion. One approach to the development of alloys resistant to hot corrosion involves the formation of a protective oxide layer based on SiO2. The feasibility of this approach has been verified. The data reported in this study agree well with those of other investigators and show a significant increase in the resistance of alloys to hot corrosive attack with increased silicon content of the alloys. Two rather limiting observations were made from this study. First, the scales forming on the high silicon containing alloys were very susceptible to spalling as a result of temperature changes. A means should be developed to increase the adherence of these scales onto the metal substrate. Secondly, the high silicon containing alloys were very brittle and probably could not withstand the mechanical stresses occurring within operating turbines. It would be more feasible for these alloys to be utilized as a surface coating on an alloy whose mechanical properties are more in accord with turbine material requirements. GRA

N80-22469# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
DEFORMATION AND FRACTURE OF ADVANCED ANISOTROPIC SUPERALLOYS Final Report, 1 Oct. 1975 - 30 Sep. 1979
Anthony F. Giamei Nov. 1979 77 p refs
(Contract F44620-76-C-0028; AF Proj. 2306)
(AD-A080088; PWA-FR-12637; AFOSR-80-0033TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

The modern single crystal superalloy baseline of Ni-5Al-2Ti-1Nb-9Cr-12W (by weight) was selected (PWA 1444). The Re/W ratio was varied from 0.0 to 1.0 as the Re + W was held constant at 12 wt %. Single crystals were grown with axial orientations of <001>, <110> <111> from four different alloys and were fully heat treated (gamma prime solution + age). An additional alloy was made at 4Ta/4W/4Re in the three high symmetry orientations. Test specimens of the compressive and tensile creep/rupture design were obtained by sectioning or electrochemical machining. Creep data were obtained in tension

and compression with temperature/stress combinations of 816 C/650 Mpa, 899 C/380 MPa, 982 C/220 MPa, and 1066 C/138 MPa. Crystals were characterized by chemical analysis, optical metallography, and crystallographic orientation determination by the Laue method. GRA

N80-22470# Oregon Graduate Center for Study and Research, Beaverton.
EFFECT OF RETAINED AUSTENITE ON HYDROGEN EMBRITTLEMENT OF STEELS Final Report, 1 Sep. 1976 - 31 Aug. 1979
W. E. Wood 14 Nov. 1979 18 p refs
(Grants DAAG29-76-G-0317; DAAG29-78-G-0158)
(AD-A078988; ARO-13894.2-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

Ultrahigh strength steel alloys heat treated to 200,000 psi yield strength levels are notoriously sensitive to hydrogen induced delayed failure. In this program the effects of microstructure, especially that of retained austenite, on hydrogen induced (1) threshold stress intensity level; (2) crack growth rate; and (3) fatigue crack growth rate have been investigated. Microstructural variables investigated included prior austenite grain size, twinning, carbides, retained austenite, and indirectly, segregation. Emphasis in this study has been placed on the contribution of and stability of retained austenite. Optical, scanning electron microscopy, and transmission electron microscopy have been employed to establish microstructural details. Compact tension and bolt loaded fracture toughness specimens were used throughout the program. Precision hydrogen measurement were carried out by the Boeing Company. It was necessary to measure the hydrogen content for each sample, since it was not possible to introduce consistent hydrogen levels by cathodically charging. The influence of retained austenite is limited by its instability at the crack tip, where it has been shown to transform due to the intense stresses and strains in the plastic zone. Acoustic emission analysis was employed to detect and study the microscopic nature of crack growth as well as to establish a threshold stress intensity level. Test results showed that retained austenite, grain size, and probable segregation each contribute towards altering the hydrogen induced delayed failure characteristics. GRA

N80-22471# Minnesota Univ., Minneapolis. Dept. of Chemistry.
MOLECULAR DIPOLE MODEL FOR THE INTERNAL OPTIC MODES OF SURFACE ADSORBED MOLECULES, CLASSICAL IMAGE THEORY
Henry Nichols and Robert M. Hexter Jan. 1980 45 p refs
(Contract N00014-77-C-0209)
(AD-A080464; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

A molecular dipole model is developed to describe dipolar coupling in surface adsorbed molecules using classical image theory. Only the internal optic modes of the adsorbed molecules are considered. Expanding the dipoles associated with both real and image molecules in terms of the same molecular normal coordinate results in a frequency shift twice that previously expected for dipolar coupling in adsorbed molecules. Application of the model to carbon monoxide adsorbed on platinum indicates that the observed frequency vs. coverage behavior can be attributed to dipolar coupling. The irreducible corepresentations of Shubnikov type 2, or grey, groups are used to describe the symmetry and spectroscopic activity of the molecule-plus-image system. Infrared activity is associated only with molecular vibrations having non-zero dipole moment derivative components perpendicular to the surface. Raman activity is associated only with those molecular vibrations having non-zero Raman scattering tensor elements alpha(xx), alpha(yy), alpha(zz), or alpha(xy), where z is perpendicular to the surface. GRA

N80-22472# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE HUGONIOT OF 4340 STEEL RC 54-55 Final Report
Robert E. Franz and Joseph L. Robitaille Sep. 1979 16 p refs
(DA Proj. 1W6-62618-AH-80)
(AD-A076968; AD-E430321; ARBRL-MR-02951) Avail: NTIS HC A02/MF A01 CSCL 11/6

The Hugoniot of 4340 steel of Rockwell 'C' hardness 54-55 has been measured. The alpha or b.c.c. phase Hugoniot can be represented by the equation U = 4.67 - 1.44 u where U is the wave velocity and u is the particle velocity in km/s. The Hugoniot of the epsilon or h.c.p. phase above the 13GPa transition point is close to that of rolled homogeneous armor. GRA

N80-22473# Wisconsin Univ. - Madison.
SOLIDIFICATION OF HIGHLY UNDERCOOLED LIQUID METALS AND ALLOYS Final Report, 15 Aug. 1976 - 14 Aug. 1979
J. H. Perepezko 17 Jan. 1980 12 p refs Sponsored in part by Office of Naval Res.
(Grants DAAG29-76-G-0316; DAAG29-78-G-0157; DA Proj. 1L1-61102-BH-57)
(AD-A080791; ARO-14190.5-MS) Avail: NTIS HC A02/MF A01 CSCL 07/4

The undercooling and solidification of liquid alloys in fine droplet form has been examined by thermal analysis, X-ray diffraction and metallography. New maximum undercooling limits have been established for several metals and hypercooling has been demonstrated for the first time in a metallic system. In alloys, some aspects of the phase selection kinetics for formation of metastable phases have been identified in eutectic, peritectic and monotectic reactions. The use of droplet samples allows the measurement of thermodynamic properties of undercooled liquids and the study of microstructure development with changing undercooling. In some alloys, the effective isolation of nucleants that is possible with micron size droplets results in a continuous solidification to the amorphous state. The observations are presented in terms of the potential of undercooling for structure modification and rapid solidification technology. GRA

N80-22474# Oak Ridge National Lab., Tenn.
EFFECTS OF THERMOMECHANICAL TREATMENT ON PHASE STABILITY AND SWELLING IN ALLOY D9
E. H. Lee and A. F. Rowcliffe 1979 12 p
(Contract W-7405-eng-26)
(CONF-790979-1) Avail: NTIS HC A02/MF A01

The composition range for greater phase stability was investigated and processing methods to improve alloy homogeneity were modified. The irradiation response to variations of thermomechanical treatment was studied for heat 7438 of alloy D9. A combination of diffraction analysis and energy dispersive spectroscopy was used to identify five major phases which develop in D9 during neutron irradiation. Results are reported. DOE

N80-22475*# New Mexico Univ., Albuquerque. Technology Application Center.
EUTECTIC ALLOYS. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1976 - Jan. 1980
Peter Moore Jan. 1980 66 p Sponsored in part by NASA and NTIS
(NASA-CR-162932; PB80-803877) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

These 250 abstracts from the international literature provide summaries of the preparation, treatments, composition and structure, and properties of eutectic alloys. Techniques for directional solidification and treatments including glazing, coating, and fiber reinforcement are discussed. In addition to the mechanical and thermal properties, the superconducting, corrosion, resistance, and thermionic emission and adsorption properties are described. GRA

N80-22476# Bureau of Mines, Washington, D. C.
COPPER
H. J. Schroeder Sep. 1979 25 p refs
(PB80-126030) Avail: NTIS HC A02/MF A01 CSCL 08I

In addition to data on byproducts and coproducts, comprehensive data on copper is presented including industry structure, uses, reserves-resources, technology, supply-demand relationships, strategic considerations, economic factors and problems, operating factors and problems, and outlook to 2000. GRA

N80-22477# Bureau of Mines, Washington, D. C. Office of Assistant Director, Metals, Minerals and Materials.
BERYLLIUM: MINERAL COMMODITY PROFILES

Benjamin Petkof Aug. 1979 17 p refs
(PB80-125438; LC-79-20066) Avail: NTIS HC A02/MF A01 CSCL 08I

Beryllium, a high-strength, lightweight metal with excellent anticorrosion characteristics is used in a large number of industrial applications. Comprehensive data presented on beryllium covers industry structure, uses, reserves-resources, technology, supply-demand relationships, byproducts and coproducts, strategic considerations, economic factors and problems, operating factors and problems and outlook to 2000. GRA

N80-22478*# New Mexico Univ., Albuquerque. Technology Application Center.
CORROSION CHARACTERISTICS OF NICKEL ALLOYS. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 1979
Gerald F. Zollars Dec. 1979 125 p Sponsored by NASA and NTIS
(NASA-CR-163060; PB80-803042) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

This bibliography cites 118 articles from the international literature concerning corrosion characteristics of nickel alloys. Articles dealing with corrosion resistance, corrosion tests, intergranular corrosion, oxidation resistance, and stress corrosion cracking of nickel alloys are included. GRA

N80-22479# National Technical Information Service, Springfield, Va.
POWDER METALLURGY OF IRON. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1979
William E. Reed Dec. 1979 232 p Supersedes NTIS/PS-78/1327; NTIS/PS-77/1177; NTIS/PS-76/0990; NTIS/PS-75/709
(PB80-803232; NTIS/PS-78/1327; NTIS/PS-77/1177; NTIS/PS-76/0990; NTIS/PS-75/709) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

These citations of Federally-funded research reports cover ferrous metal powder compacting, pressing, sintering and fabrication. Properties are discussed in relation to processing. This updated bibliography contains 225 abstracts, 19 of which are new entries to the previous edition. GRA

N80-22480# National Technical Information Service, Springfield, Va.
POWDER METALLURGY OF IRON, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Jan. - Nov. 1979
William E. Reed Dec. 1979 268 p Supersedes NTIS/PS-78/1329; NTIS/PS-77/1178; NTIS/PS-76/0992
(PB80-803240; NTIS/PS-78/1329; NTIS/PS-77/1178; NTIS/PS-76/0992) Avail: NTIS HC $30.00/MF $30.00 CSCL 11F

Worldwide journal research is cited on compacting, sintering, pressing, forming, forging, and fabrication of ferrous metal powders. Mechanical properties, physical properties, and structure of powdered iron and steel products are also reported. Abstracts of research on iron powder production are included. This updated bibliography contains 261 abstracts, 124 of which are new entries to the previous edition. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-22481 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE VISCOELASTIC SHEAR BEHAVIOR OF A STRUCTURAL ADHESIVE Ph.D. Thesis
Erol Sancaktar 1979 116 p
Avail: Univ. Microfilms Order No. 8007947

A linear viscoelastic method of predicting the pure shear behavior from the bulk tensile data is presented. Constant strain rate, relaxation and creep measurements are given for bulk and bonded adhesive modes using symmetric rail shear and lap shear test specimens, respectively. Experimental results show that both bulk and bonded shear stress strain response have a region of near linear elasticity followed by a region of viscoelasticity terminating with yielding. Delayed failure and relaxation behaviors are observed in shear. Elastic shear stresses and strains are shown to be predictable from the tensile results. Viscoelastic stresses and strains, however, are not predictable by using the proposed method. Large viscoelastic strains are obtained in pure shear. The specimens display both geometric and stress strain nonlinearities in shear. The results suggest that model adhesive may exhibit different viscoelastic deformation mechanisms in shear and tension. Dissert. Abstr.

N80-22482 Missouri Univ., Kansas City.
AN INVESTIGATION OF PROPYLENE GLOW DISCHARGE POLYMERIZATION Ph.D. Thesis
Ashok Kumar Sharma 1979 230 p
Avail: Univ. Microfilms Order No. 8009375

The glow discharge polymerization of propylene was investigated using an electrodeless, electromagnetically coupled (inductive coupling perpendicular to the reactor) tubular reactor operating at a radio frequency of 27.120 MHz. The effects of polymerization parameters, i.e., time, monomer flow rate, inert gas, substrate position, and vacuum system efficiency on the rate of polymer deposition were studied in detail. It was observed that monomer flow rate (at constant pumping efficiency) exerts the greatest effect on the quality of polymer adhesion to glass and aluminum substrates. Good adhering polymeric films were obtained only at high flow rates (above 250 micromols/min reactor pressure 0.1 torr) where the deposition rate decreases with increase in monomer flow rate. This principle also applies to ethylene, propane and allyl bromide monomers. Dissert. Abstr.

N80-22483 Oklahoma Univ., Oklahoma City.
A RHEOLOGICAL STUDY OF ELASTOMERS Ph.D. Thesis
Man-Sheng Wang 1979 228 p
Avail: Univ. Microfilms Order No. 8008664

Creep results at room temperature during uniaxial, unconfined compressive loading of vulcanized and unvulcanized natural rubber and styrene-butadiene copolymer are presented. A combined equation of the power law and the sine hyperbolic function that relates strain with time was derived from the basic creep data. Creep rate was obtained by means of differentiation of the original creep data. The plot of creep rate versus time was used to understand the change of creep stages for the rubbers studied. The swelling of vulcanized rubbers in two organic solvents, paraffinic hydrocarbon (kerosene, C14H30) and one belonging to the aromatic family (benzene, C6H6), were investigated. Creep and rebound tests of those swollen rubbers were conducted and the results were compared with the ordinary samples. Dissert. Abstr.

N80-22484* Ultrasystems, Inc., Irvine, Calif.
STUDY OF CROSSLINKING AND DEGRADATION MECHANISMS IN SEALANT POLYMER CANDIDATES Final Report
K. L. Paciorek, J. Kaufman, T. I. Ito, J. H. Nakahara, and R. H. Kratzer Mar. 1980 63 p refs
(Contract NAS2-9779)
(NASA-CR-152346; SN-3003-F) Avail: NASA. Ames Res. Center

Practical cross-linking and/or chain extension processes for perfluoroalkylether based sealants were studied. The two linking groups investigated were 1, 2, 4-oxadiazoles and s-triazines. The synthesis of difunctional, fully characterized, prepolymers and the evaluation of the curing reactions utilizing these materials are discussed. E.D.K.

N80-22485 University of Southern Mississippi, Hattiesburg.
MODIFICATION OF POLYMERIC SUBSTRATES FOR UTILIZATION AS BIOMEDICAL MATERIALS Ph.D. Thesis
James Alexander Pelezo 1979 253 p
Avail: Univ. Microfilms Order No. 8008115

Hydrophilic multiblock polyurethane elastomers were investigated for utilization as possible balloon ventricles in artificial cardiac devices. Such materials should possess a high degree of mechanical durability, be biologically compatible, and be processable from either the melt or from solution. Homogeneous solutions

of polysaccharides were prepared and used as novel reaction media for the preparation of hydrolytically labile urethane pendent groups. Several types of nylon 1, prepared by anionic polymerization of isocyanates, also served as model polymers that could release therapeutic agents or pesticides by hydrolysis. Two specific analytical techniques, ultraviolet spectrophotometry and high pressure liquid chromatography, were used as methods for evaluating the delivery of the amine to the aqueous medium. The high pressure liquid chromatography method was found to possess definite advantages over the UV spectrophotometric method. Dissert. Abstr.

N80-22486 Michigan Univ., Ann Arbor.
PHYSICAL PROPERTIES OF ELASTOMERIC POLYMER NETWORK Ph.D. Thesis
Mohammed Abdel-Gawwad Sharaf 1979 373 p
Avail: Univ. Microfilms Order No. 8007836

Stress-strain measurements carried out on networks formed from 1,4-polybutadiene (PBD) samples of various cis-trans stereochemical structures were examined. The networks were crosslinked using a variety of crosslinking techniques, specifically gamma radiation, high energy electrons, ultraviolet radiation, and peroxide cures. The networks obtained were studied up to and including rupture. The highly stereoregular ones exhibited strain-induced crystallization and showed anomalous deviations from linearity in their stress-strain isotherms at high elongation. Focusing special attention on the physical processes that culminate in rupture of the networks confirmed and extended the primary role played by strain-induced crystallization. As a consequence, the non-Gaussian effects, *i.e.*, the limited chain extensibility, can occur under such conditions but is virtually impossible to characterize in the presence of the crystallization. Dissert. Abstr.

N80-22487 Drexel Univ., Philadelphia, Pa.
POWDER PROCESSING OF ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE Ph.D. Thesis
George Wayne Halldin 1980 260 p
Avail: Univ. Microfilms Order No. 8008282

Ultra-high molecular weight polyethylene (UHMW-PE) has excellent impact strength and abrasion resistance properties but is available in powder form only and can generally be processed only by compression molding. The feasibility of using the solid state forming process of powder preform forging was examined in order to overcome these processing difficulties. The forging process, with dwell times in the die of only two minutes was found to give useful, and in some cases, superior, tensile and fracture toughness properties compared to compression molded material. The preform production technology was investigated in detail. Powder from three different manufacturers was characterized by a wide range of tests. The powder were shown to be appreciably different in terms of particle size and particle morphology. The compressibility and green strength of each powder was evaluated. Dissert. Abstr.

N80-22488 Illinois Univ. at Urbana-Champaign.
HIGH PRESSURE POLARIZED AND UNPOLARIZED FLUORESCENCE STUDIES OF MACROMOLECULES Ph.D. Thesis
George S. Chryssomallis 1979 150 p
Avail: Univ. Microfilms Order No. 8009002

The development of an instrument which can measure the linear polarization of fluorescence of a system under large hydrostatic pressure is discussed. High pressure was used to change the viscosity of the medium, which was necessary in order to characterize the relaxation processes of a fluorescent molecule in solution. The drawbacks of the temperature variation method could be avoided, and in certain cases the pressure variation method proved to be a valuable complement to the conventional ways of changing the viscosity. The validity and accuracy of the method of measurement and analysis was tested by using three fluorescent dyes in solution. Parallel temperature variation and pressure variation experiments confirmed that the two were equivalent in changing the solvent viscosity in the proximity of the rotating molecule.Dissert. Abstr.

N80-22489 Pennsylvania State Univ., University Park.
MASS TRANSFER IN LAMINAR FLOW FIELD WITH ULTRAFILTRATION AND ITS APPLICATION IN POLYMER FRACTIONATION Ph.D. Thesis
Wei-Chang Liauh 1979 156 p
Avail: Univ. Microfilms Order No. 8008439

The mass transfer of polymer molecules in a semipermeable laminar flow tube was studied. It mainly concerns three subjects: the development of porous capillary chromatography (PCC); the initial development of solute concentration distribution in Taylor dispersion; and the application of the finite difference method in process stimulation. The results have provided insight concerning the mass transport process in a laminar flow field with ultrafiltration, and have revealed the potential of a polymer fractionation technique based on this transport process. A mathematical model was developed to correlate solute retention time to solute Peclect number and consequently to the solute diffusion coefficient. By applying this model, PCC can be used to obtain polymer diffusion coefficients. Pertinent results are reported. Dissert. Abstr.

N80-22490 Utah Univ., Salt Lake City.
THE EFFECT OF THE MOLECULAR WEIGHT AND MOLECULAR WEIGHT DISTRIBUTION ON THE VISCOELASTIC FLOW FUNCTIONS OF LINEAR POLYSTYRENE SOLUTIONS Ph.D. Thesis
Hong Wen Gao 1979 407 p
Avail: Univ. Microfilms Order No. 8008340

The dependence of the steady and time dependent viscoelastic flow functions on the molecular weight and molecular weight distribution for linear polystyrene solutions in normal butyl benzene were determined. The shear stresses, and first and second normal stress differences for several linear mono and polydisperse polystyrene solutions undergoing steady state shearing, oscillatory shearing, and stress growth and stress decay were determined at 25 plus or minus 0.1 C in cone and plate geometry by means of a stiffened Weissenberg rheogoniometer. Stress growth at the onset of steady shearing and stress decay at the cessation of steady shearing for each polymer solution were measured at the highest shear rate obtainable with a 6 deg cone.
Dissert. Abstr.

N80-22491*# Hughes Aircraft Co., Culver City, Calif. Advanced Technology Lab.
DEVELOPMENT OF ULTRAVIOLET RIGIDIZABLE MATERIALS Final Report
D. P. Salisbury Oct. 1979 42 p
(Contract NAS8-32895)
(NASA-CR-161426; FR-79-76-1290; HAC-F2545) Avail: NTIS HC A03/MF A01 CSCL 11G

A series of tests was performed to determine an optimum resin to be used as a UV rigidizable matrix in expandable rigidizable space structures. Commercially available resins including several types of polyesters, epoxies, epoxy-acrylics, an acrylic and a urethane were used as well as a polyester, produced by 3M Company's Solar Laboratory facility, which was found the best from the standpoint of physical properties and ability to be 'B' staged. Two other synthesized materials were also tested, but were not found to be superior to the Solar resin. An optimum fabric for use with the preferred resin was not found; however, the 15 ounce fabric from Solar Laboratories has the best combination of physical properties with respect to handling and processing characteristics. Expansion techniques for tubular structures, 'B' staging of the solar resin, and stowage techniques for up to 5 months were developed. A one meter high tetrahedron preprototype structure was prepared to evaluate and demonstrate stowage, deployment, and rigidization techniques. A.R.H.

N80-22492*# Solar Turbines International, San Diego, Calif.
DEVELOPMENT OF FIRE-RESISTANT, LOW SMOKE GENERATING, THERMALLY STABLE END ITEMS FOR COMMERCIAL AIRCRAFT AND SPACECRAFT USING A BASIC POLYIMIDE RESIN Final Report, 15 Dec. 1977 - 15 Apr. 1980
J. Gagliani, R. Lee, U. A. K. Sorathia, and A. L. Wilcoxson
15 Apr. 1980 176 p refs
(Contract NAS9-15484)
(NASA-CR-160576; SR79-R-4674-38) Avail: NTIS HC A09/MF A01 CSCL 07C

A terpolyimide precursor was developed which can be foamed by microwave methods and yields foams possessing the best seating properties. A continuous process, based on spray drying

techniques, permits production of polyimide powder precursors in large quantities. The constrained rise foaming process permits fabrication of rigid foam panels with improved mechanical properties and almost unlimited density characteristics. Polyimide foam core rigid panels were produced by this technique with woven fiberglass fabric bonded to each side of the panel in a one step microwave process. The fire resistance of polyimide foams was significantly improved by the addition of ceramic fibers to the powder precursors. Foams produced from these compositions are flexible, possess good acoustical attenuation and meet the minimum burnthrough requirements when impinged by high flux flame sources. A.R.H.

N80-22493*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STEADY-STATE WEAR AND FRICTION IN BOUNDARY LUBRICATION STUDIES

William R. Loomis and William R. Jones, Jr. May 1980 11 p refs

(NASA-TP-1658; E-129) Avail: NTIS HC A02/MF A01 CSCL 11G

A friction and wear study was made at 20 C to obtain improved reproducibility and reliability in boundary lubrication testing. Ester-base and C-ether-base fluids were used to lubricate a pure iron rider in sliding contact with a rotating M-50 steel disk in a friction and wear apparatus. Conditions included loads of 1/2 and 1 kg and sliding velocities of 3.6 to 18.2 m/min in a dry air atmosphere and stepwise time intervals from 1 to 250 min for wear measurements. The wear rate results were compared with those from previous studies where a single 25 min test period was used. Satisfactory test conditions for studying friction and wear in boundary lubrication for this apparatus were found to be 1 kg load; sliding velocities of 7.1 to 9.1 m/min (50 rpm disk speed); and use of a time stepwise test procedure. Highly reproducible steady-state wear rates and steady-state friction coefficients were determined under boundary conditions. Wear rates and coefficients of friction were constant following initially high values during run-in periods. Author

N80-22494*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRICTION AND WEAR OF IRON-BASE BINARY ALLOYS IN SLIDING CONTACT WITH SILICON CARBIDE IN VACUUM

Kazuhisa Miyoshi and Donald H. Buckley May 1980 11 p refs

(NASA-TP-1612; E-260) Avail: NTIS HC A02/MF A01 CSCL 11F

Multipass sliding friction experiments were conducted with various iron base binary alloys in contact with a single crystal silicon carbide surface in vacuum. Results indicate that the atomic size and concentration of alloy elements play important roles in controlling the transfer and friction properties of iron base binary alloys. Alloys having high solute concentration produce more transfer than do alloys having low solute concentration. The coefficient of friction during multipass sliding generally increases with an increase in the concentration of alloying element. The change of friction with succeeding passes after the initial pass also increases as the solute to iron, atomic radius ratio increases or decreases from unity. Author

N80-22495# Rochester Univ., N. Y. Dept. of Mechanical and Aerospace Sciences.

MICROSTRUCTURAL PROCESSES IN THE DEFORMATION AND FRACTURE OF POLYMERS Final Report, 1 Aug. 1976 - 30 Sep. 1979

J. C. M. Li 17 Dec. 1979 16 p refs

(Grants DAAG29-76-G-0314; DAAG29-78-G-0159)

(AD-A080029; ARO-13566.4-MS) Avail: NTIS HC A02/MF A01 CSCL 11/9

Shear bands in polystyrene were characterized with respect to their surface morphology, shear strain distribution, strain recovery by annealing, intersection behavior, splitting and joining processes, and yield criteria. Three kinds of shear bands are differentiated: fine bands, coarse bands, and thick bands. The first two kinds have different yield criteria, propagation modes, and surface appearances. The latter two kinds have many similarities. It seems that molecular alignment of directional defects must present in shear bands. GRA

N80-22496# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.

NEW METHODS FOR SOLID STATE EXTRUSION OF HIGHLY ORIENTED POLYMERS Interim Report

Michael P. C. Watts, Anagnostis E. Zachariades, and Roger S. Porter 14 Dec. 1979 29 p refs

(Contract N00014-75-C-0686)

(AD-A079128; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/9

Techniques are reviewed and extended for solid state deformation of semicrystalline polymers. Emphasis has been placed on solid state extrusion and its variations that include coextrusion, reversible plasticizers and powder deformation. The properties of extrudates are examined in regard to anisotropy with the goals of maximum orientation, tensile properties and the efficiency of deformation. GRA

N80-22497# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

CROSSLINKING CHEMISTRY FOR FLUOROCARBON ETHER BIBENZOXALE POLYMERS Final Report, May 1976 - Jun. 1978

R. C. Evers and T. Abraham Nov. 1979 33 p refs

(AF Proj. 2419)

(AD-A079798; AFML-TR-79-4148) Avail: NTIS HC A03/MF A01 CSCL 11/9

Curable and hydrolytically stable FEB copolymers were synthesized by the acetic acid-promoted copolycondensation of tetrafluoroethylene oxide; hexafluoropropylene oxide-derived dithioimidate esters with fluorocarbon ether bis(o-aminophenol) monomers and a fluorocarbon bis(o-aminophenol) monomer containing an aliphatic hydrocarbon cure site. The structure of the cure site monomer was molecularly tailored to possess sufficient solubility and reactivity during the polycondensation reactions to permit incorporation of the appropriately structured cure sites into the FEB copolymer backbone. Thermogravimetric analysis and isothermal aging studies indicated high thermooxidative stability almost comparable to analogous FEB polymers void of the hydrocarbon cure sites. Isothermal aging in air at 260C (500F) and 288C (550F) for 200 hours led to weight losses of 7 and 17 percent, respectively. Preliminary formulation and curing studies demonstrated the reactivity of the cure sites to radical-induced cure reactions. Based on the low temperature viscoelastic properties, the high thermooxidative and hydrolytic stability, as well as the ready curability of the FEB copolymers, a broader use temperature range capability than currently available in state-of-the-art elastomer materials is envisioned. GRA

N80-22498# California Inst. of Tech., Pasadena.

POLYMER ATTACHED CATALYSTS Final Report, 1 Mar. - 31 Aug. 1979

Robert H. Grubbs Jan. 1980 5 p refs

(Contract DAAG29-79-C-0051)

(AD-A080577; ARO-16358.1-C) Avail: NTIS HC A02/MF A01 CSCL 07/3

Monomers containing two ligand groups separated by either flat aromatic groups or long alkyl chains were prepared. These materials were used to make polymers, with nickel(2) or phi-rhodium(1) halides in order to link the monomer units. The major part of the study used 1,12-bis(diphenylphosphino)-dodecane as the monomer unit. Polymethylmethacrylate-Pt composites were evaluated as oxidation catalysts and as electrode coatings. GRA

N80-22499# Defence Research Establishment, Ottawa. (Ontario). Environmental Protection Section.

AN APPARATUS FOR THE MEASUREMENT OF THE WATER-VAPOUR PERMEABILITY OF TEXTILES

Brian Farnworth Jun. 1979 17 p refs

(AD-A074142; DREO-TN-79-1) Avail: NTIS HC A02/MF A01 CSCL 11/5

An apparatus has been constructed to measure the water vapor resistance of textiles, in particular those such as battings and piles that are highly air permeable and have low vapor resistances. The technique has been tested by measuring the

water vapor resistance of air gaps in the range 1 to 8 mm thickness. No systematic errors were observed with a random error in the resistance measurement equivalent to 0.5 mm of still air. GRA

N80-22500# Marquette Univ., Milwaukee, Wis. Dept. of Chemistry.
IMMOBILIZED MICELLES Final Technical Report, 1 Sep. 1976 - 31 Oct. 1979
Steven L. Regen 15 Jan. 1980 9 p refs
(Grant DAAG29-76-G-0330)
(AD-A080587; ARO-14353.1-C) Avail: NTIS HC A02/MF A01 CSCL 11/9

Research carried out under this ARO-supported program has involved the preparation, development and mechanistic analysis of insoluble polymers exhibiting micelle or cosolvent-like properties. Motivation for this work derived from the expectation that such materials would be of considerable practical importance as catalysts for the hydrolytic destruction of mustard gas. GRA

N80-22501# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
NEW CONDUCTIVE POLYMERIC MATERIALS: COFACIAL ASSEMBLY OF MIXED VALENT METALLOMACROCYCLES Interim Report
Tobin J. Marks, Karl F. Schoch, Jr., and Bhagyashree R. Kundalkar 28 Jan. 1980 35 p refs
(Contract N00014-77-C-0231)
(AD-A081010; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/3

This paper reports on an approach to control molecular stacking interactions in low-dimensional mixed valence materials by locking partially oxidized metallomacrocycles together in a cofacial orientation. Iodine doping of the face-to-face linked oligomers (M(Pc)O)n (M = Si, Ge, Sn; Pc = phthalocyaninato) produces electrically conductive polymers (M(Pc)O)Ix n with a wide range of x stoichiometries. Resonance Raman spectroscopy indicates that the iodine has oxidized the polymer chain. Polymer structure has been studied by X-ray powder diffraction, and it is possible to estimate interplanar spacings. Halogen doping of the (M(Pc)O) n materials is accompanied by electrical conductivity increases as large 1/10 to the 7th power (ohm cm); the general trend is sigma Si = or approximate sigma Ge = sigma Sn. Variable temperature conductivity and magnetic susceptibility data are reported. GRA

N80-22502# Sandia Labs., Albuquerque, N. Mex.
CHARACTERIZATION AND PROPERTIES OF PLASMA POLYMERIZED 2-VINYLPYRIDINE
K. W. Bieg, D. K. Ottesen, and K. L. Brower Nov. 1979 68 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1798) Avail: NTIS HC A04/MF A01

The chemical structure, aging, thermal, and adhesive behavior of plasma deposited 2-vinylpyridine was investigated. The molecular structure of the plasma polymer is significantly different from the conventional, linear polymer and is strongly dependent on plasma reactor variables. Additional cyano, methyl, and olefinic groups were identified in the plasma polymer, and aromaticity retention was reduced at the more severe (low pressure, high RF power) reactor conditions studied. Postdeposition oxidation occurred, which followed approximately first order kinetics initially. Oxidation was significantly reduced in vacuum, inert gas, and hydrogen atmospheres. Thermal weight loss began at relatively low temperatures and appeared to accompany an exothermic, irreversible crosslinking reaction which began at about 100 C. A quantitative tensile pull adhesion test was developed. Using this technique, the plasma polymer aluminum cohesive bond strength was found to be 480 psi and was degraded at high humidity levels. DOE

N80-22503# Defence Research Information Centre, Orpington (England).
THE EFFECT OF PROCESSING CONDITIONS ON THE GENERAL PROPERTIES OF PLASTICS, PART 1
P. Thienel, G. Wuebken, J. Opfermann, G. Ziegmann, K. deZeeuw, K. Beyer, R. Krueger, N. Berndtsen, H. Berg, and G. Menges London HMSO Aug. 1979 41 p refs Transl. into ENGLISH from Kautsch. Gummi Kunstst. (West Germany), v. 31, no. 7, 1978 p 510-519
(DRIC-T-5721; BR70171) Avail: NTIS HC A03/MF A01

Structural features which are affected by manufacturing conditions are discussed. This includes molecular orientation, residual stress state and crystallinity, and structural formation. The production of parts by polystyrene injection molding and its effect on residual stress, orientation, and mechanical properties is considered. Finally, thermal shock treatment in the electroplating of plastics and its effect of relaxation curves, adhesive strengths and residual stresses are described. Author (ESA)

N80-22504*# New Mexico Univ., Albuquerque. Technology Application Center.
SILICON NITRIDES: CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 79
Gerald F. Zollars and William R. Bozman Feb. 1980 83 p Sponsored in part by NASA and NTIS
(NASA-CR-162930; PB80-804289) Avail: NTIS HC A05/MF A01 CSCL 11B

This bibliography of citations to the international literature concerns studies of the properties of silicon nitrides. Topics covered are mechanical properties, microstructure, fracture strength, reaction kinetics, crack propagation, and high temperature tests of silicon nitrides. Applications of silicon nitrides in gas turbines and as a radome material are included. GRA

N80-22505*# New Mexico Univ., Albuquerque. Technology Application Center.
ALUMINUM OXIDES: CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 1979
Gerald F. Zollars and William R. Bozman Feb. 1980 65 p Sponsored in cooperation with NASA and NTIS
(NASA-CR-162934; PB80-804271) Avail: NTIS HC A04/MF A01 CSCL 11B

A bibliography of 285 citations to the international literature concerning studies of the properties of aluminum oxides is given. Mechanical properties, fracture strength, microstructure, and high temperature tests are covered. GRA

N80-22506# National Technical Information Service, Springfield, Va.
THE CHEMISTRY OF RESINS, VOLUME 2: CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Jan. 1980
Diane M. Cavagnaro Feb. 1980 68 p Supersedes NTIS/PS-79/0015; NTIS/PS-78/0050 and NTIS/PS-77/0063
(PB80-804370; NTIS/PS-79/0015; NTIS/PS-78/0050; NTIS/PS-77/0063) Avail: NTIS HC $30.00/MF $30.00 CSCL 07C

The synthesis, polymerization, and chemical reactions of silicone and silicon-containing polymers and copolymers are considered in these citations of federally funded research. Topics include grafting and crosslinking reactions, radiation polymerization, and spectra and molecular structure as they relate to properties. This bibliography contains 61 abstracts, 14 of which are new entries to the previous edition. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

N80-22507 Illinois Univ. at Urbana-Champaign.
A STEAM PROCESS FOR THE GASIFICATION OF COAL Ph.D. Thesis
Ronald Thomas Gibbs 1979 194 p
Avail: Univ. Microfilms Order No. 8009042

A process was studied for the gasification of coal which uses superheated steam in excess of stoichiometric amounts as the heat source for the endothermic gasification reactions. Energy

to generate and superheat the steam was derived by burning a part of the cleaned product gas stream thus avoiding air pollution problems. The excess steam combined with the absence of oxygen in the reactor resulted in sulfur from the coal being converted to hydrogen sulfide with final removal as raw sulfur. Results show the feasibility of the process at temperatures above 1300 K. Further, results showed reasonable agreement with predictions made by the kinetic model. Dissert. Abstr.

N80-22508# Union Carbide Corp., Tonawanda, N.Y.
DIRECT IGNITION OF PULVERIZED COAL WITH ARC HEATED AIR
Philip R. Blackburn 1980 39 p refs Backup document for AIAA synoptic, 'Ignition of Pulverized Coal with Arc Heated Air', scheduled for publication in Journal of Energy, May - Jun. 1980
Avail: NTIS HC A03/MF A01

Current power plant practice, with suspension fired boilers, involves consumption of large quantities of premium fuel to accomplish ignition of pulverized coal. A new approach to coal ignition is described. A vortex stabilized electric arc heater was attached to a full scale commercial pulverized coal burner. A continuous arc heated air jet was used as an ignition source. The equipment was operated in a power plant. Ignition was accomplished with igniter input power levels which are lower than conventional practice by a factor of six. Cost of an igniter system for a 150 million BTU/hr coal burner is estimated. It is shown that the arc igniter is economically viable and is competitive with conventional practice. Author

N80-22509*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
LABORATORY MEASUREMENTS IN A TURBULENT, SWIRLING FLOW Final Report
David P. Hoult Nov. 1979 52 p refs
(Grant NsG-3076)
(NASA-CR-159723) Avail: NTIS HC A04/MF A01 CSCL 21D

Measurements of soot inside a flame-tube burner using a special water-flushed probe are discussed. The soot is measured at a series of points at each burner, and upon occasion gaseous constituents NO, CO, hydrocarbons, etc., were also measured. Four geometries of flame-tube burners were studied, as well as a variety of different fuels. The role of upstream geometry on the downstream pollutant formation was studied. It was found that the amount of soot formed in particularly sensitive to how aerodynamically clean the configuration of the burner is upstream of the injector swirl vanes. The effect of pressure on soot formation was also studied. It was found that beyond a certain Reynolds number, the peak amount of soot formed in the burner is constant. F.O.S.

N80-22510*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
LONG TERM STORAGE TEST OF TITANIUM MATERIAL WITH LIQUID FLUORINE PROPELLANT Final Technical Report, 27 Jan. 1976 - 15 Nov. 1979
J. R. Denson, W. D. English, J. Roth, and A. Toy 15 Dec. 1979 277 p refs
(Contracts NAS7-100; JPL-954450)
(NASA-CR-162872; TRW-29279-6006-RU-00; JPL-9950-320) Avail: NTIS HC A13/MF A01 CSCL 21I

The compatibility of 6AL-4V Ti with propellant grade GF2 and LF2 at 77 K for up to 3 years was investigated. Titanium double coupons, annealed or heat treated, with 16 or 64 RMS finishes, were immersed in F2 in individual Pyrex capsules and stored under LN2 for 29 and 39 months. Pre and post immersion tests were performed on the propellant and coupons. Chemical analysis of the propellant did not reveal any significant changes due to titanium corrosion. Gravimetric, visual, microscopic, and metallurgical examination with pitting analysis did not reveal gross corrosion of the titanium although pitting appears to be greater after 39 months exposure. The increase in pit size and number raises the possibility of unpredictable crack propagation instability. Fracture toughness tests are necessary to define this possibility. Author

N80-22511# Naval Surface Weapons Center, Dahlgren, Va.
BURNING VELOCITIES OF A SOLID PROPELLANT, VIA A MICROWAVE TECHNIQUE, AT ELEVATED PRESSURES AND PRESSURIZATION RATES Ph.D. Thesis - Pa. Univ., Apr. 1979 Report, 1976 - 1978
L. H. Russell Oct. 1979 269 p refs
(AD-A079791; NSWC/TR-79-378) Avail: NTIS HC A12/MF A01 CSCL 21/9

Presented are the results of a research effort to directly measure, via a microwave Doppler/phase shift technique, the burning rate of solid propellant in both steady and dynamic elevated pressure environments. The recession velocity of the propellant when it burned planarly within a small rectangular waveguide was directly proportional to the time rate of change of a measured relative phase angle. This relative phase angle was based upon the phase relationship between guided microwave reflections from two surfaces, one a reference plane and the other an effective plane created by the dielectric discontinuity at the burning propellant surface. In the pressure range from 500 to 10,000 psig, steady-state burning rate tests with a single base nitrocellulose gun propellant, M6, were sucessfully conducted in a large volume combustion fixture which incorporated a coaxial-to-waveguide adapter having unique pressure sealing microwave feedthroughs. In addition to yielding burning rate values intermediate to those from conventional closed chamber and strand burner tests, the experiments established the uncertainty in the proportionality constant linking M6 burning rate and the time derivative of relative phase angle. A one dimensional theoretical model was formulated and, with the aid of appropriately chosen constants, yielded predictions which agreed very well with the experimentally observed behavior of a solid propellant undergoing planar burning with in a waveguide. GRA

N80-22512# Louisiana State Univ. and A&M Coll., Baton Rouge. Div. of Engineering Research.
COMBUSTION KINETICS OF SELECTED AROMATIC HYDROCARBONS Final Report, 1 Jun. 1977 - 31 Aug. 1979
Richard A. Matula and Richard C. Farmer Aug. 1979 85 p refs
(Grant AF-AFOSR-3384-77; AF Proj. 2308)
(AD-A080103; AFOSR-80-0077TR) Avail: NTIS HC A05/MF A01 CSCL 21/4

The primary objective of the research program is to develop an understanding of the high temperature pyrolysis, oxidation and carbon formation processes in selected aromatic-hydrocarbon/air-combustion systems. The results of this study can be subsequently utilized to optimize the use of high-aromatic-content synthetic jet-fuels in both present and future jet combustors. Specific objectives of the research are to: study the kinetics of aromatic hydrocarbon pyrolysis in temperature and ranges of interest; study the ignition and oxidation of aromatic hydrocarbon-air systems; measure the critical fuel-oxidizer equivalence ratio for incipient soot formation in aromatic hydrocarbon-air mixtures; and develop quasi-global and/or detailed oxidation mechanisms for these aromatic hydrocarbons based on experimental data and computer modeling of the reaction systems. GRA

N80-22513# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
BURNING TO DETONATION TRANSITION IN POROUS BEDS OF A HIGH ENERGY PROPELLANT
R. R. Bernecker, D. Price, and H. Sandusky Nov. 1979 77 p refs Presented at the 16th JANNAF Combust. Meeting, Monterey, Calif., 10 Sep. 1979
(AD-A080315; NSWC/TR-79-351) Avail: NTIS HC A05/MF A01 CSCL 21/9

The deflagration to detonation transition (DDT) behavior of porous charges of a high-energy propellant (VLU) has been studied at both high and low confinements. The region of accelerating pressure buildup, necessary for DDT, occurred shortly before (both in time and distance) a transition to detonation. Propagation of compressive waves in both directions was associated with the buildup. The origin of the event producing these waves is unknown, but it appears to be a rapid heat release mechanism such as a thermal explosion. The DDT characteristics observed for this propellant are quite similar to those observed for tetryl in previous

studies. The effect of confinement on the DDT susceptibility of this material at high porosities is small. GRA

N80-22514# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.
PROPELLANT SURVEILLANCE REPORT ANB-3066 PROPELLANT Semiannual Report
Elizabeth M. Dalaba Nov. 1979 397 p refs
(AD-A080581; MANCP-417-79) Avail: NTIS HC A17/MF A01 CSCL 21/9

This report contains test results from LGM-30 F G, Stage 2 and Stage 3 propellant. Data are shown in linear regression plots. The differences between polymers used in the propellant are shown in the composite plots for very low rate tensile, high rate tensile and stress relaxation data and is most evident in gradient stress relaxation modulus. Case liner bonds continue to show significant degradation although the rate of change has slowed. GRA

N80-22515# Los Alamos Scientific Lab., N. Mex.
SPECIFIC HEAT AND THERMAL CONDUCTIVITY OF EXPLOSIVES, MIXTURES, AND PLASTIC-BONDED EXPLOSIVES DETERMINED EXPERIMENTALLY
John F. Baytos Sep. 1979 13 p refs
(Contract W-7405-eng-36)
(LA-8034-MS) Avail: NTIS HC A02/MF A01

Three tables show the specific heat and thermal conductivity of explosives and plastic-bonded explosives of interest to WX operations. Specific heat was determined by differential scanning calorimetry against sapphire standards. Thermal conductivity was determined by two means: the guarded hot-plate method or the differential scanning calorimeter comparative method on miniature samples. DOE

N80-22516# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
BIOMASS ENERGY CONVERSION WORKSHOP FOR INDUSTRIAL EXECUTIVES
1979 77 p Workshop held at Claremont, Calif., 9-10 Apr. 1979 Prepared in cooperation with Calif. Energy Comm., Sacramento
(Contract EG-77-C-01-4042)
(SERI/TP-62-299; CONF-790465) Avail: NTIS HC A05/MF A01

The potential to turn industrial waste or residue into an energy source was discussed at a workshop which provided industrial managers with current information on using residues and wastes as industrial energy sources. Successful industrial experiences were described by managers from the food processing and forest product industries, and direct combustion and low-Btu gasification equipment was examined. Some major conclusions of the conference were: numerous current industrial applications of wastes and residues as fuels are economic and reliable; off-the-shelf technologies exist for converting biomass wastes and residues to energy; a variety of financial (tax credits) and institutional (PUC rate structures) incentives can help make these waste-to-energy projects more attractive to industry. Many of these incentives are still being developed and their precise impact must be evaluated on a case-by-case basis. DOE

N80-22517# Battelle Pacific Northwest Labs., Richland, Wash.
INVESTIGATION OF GASIFICATION OF BIOMASS IN THE PRESENCE OF CATALYSTS
L. K. Mudge, R. J. Robertus, L. J. Sealock, Jr., D. H. Mitchell, S. L. Weber, and G. E. Stegen 1979 34 p refs Presented at the 8th Biomass Thermoconversion Contractors Meeting, Seattle, 31 Jul. - 1 Aug. 1979
(Contract EY-76-C-06-1830)
(PNL-SA-7939) Avail: NTIS HC A03/MF A01

The technical and economic feasibility of catalyzed biomass gasification to produce methane, hydrogen, carbon monoxide, and synthesis gases for generation of ammonia, methanol, or hydrocarbons was studied. The effect of primary catalyst concentration on gasification rate, and systems for direct generation of ammonia synthesis gas and hydrogen were defined. No promising system for direct carbon monoxide production was found. A wood feed system was installed in the Process Development Unit (PDU) and proved to be reliable and effective for metering wood into the gasifier. Temperature control in the PDV reactor system was improved. Preliminary calculations on the feasibility of catalyzed gasification of wood to produce methanol are encouraging. Status of the project is also presented. DOE

N80-22518# UOP, Inc., Des Plaines, Ill. Corporate Research Center.
UPGRADING OF COAL LIQUIDS: UPGRADING DISTILLATES FROM COAL LIQUEFACTION Annual Report, 31 Jan. 1978 - 31 Jan. 1979
A. J. deRosset, Gim Tan, and Lee Hillman May 1979 16 p refs
(Contract EF-77-C-01-2566)
(FE-2566-26) Avail: NTIS HC A02/MF A01

The coal-derived naphthas from the H-Coal and Exxon Donor Solvent (EDS) processes were hydrotreated and reformed in research pilot plants to 100 Research Octane Number (RON) gasoline. The 400 F(+) distillates from the H-Coal and EDS processes converted by hydrotreating, hydrocracking and fluid catalytic cracking (FCC). In general, hydrotreatment is required prior to either hydrocracking or FCC to reduce excessive amounts of nitrogen and to enhance processability. Hydrotreating alone will give high yields of environmentally acceptable No. 2 fuel oil. Hydrogen consumption was high, however, a portion of the hydrogen can be recovered by reforming the hydrocracked naphtha to 100 RON gasoline. Additional hydrogen can potentially be recouped by steam reforming light gases. The hydrotreated distillates responsed to fluid catalytic cracking as well as petroleum derived stocks of comparable hydrogen content. FCC gasoline product octane numbers ranged from 92 to 99 RON. DOE

N80-22519# UOP, Inc., Des Plaines, Ill. Corporate Research Center.
UPGRADING OF COAL LIQUIDS: HYDROTREATING AND REFORMING EXXON DONOR SOLVENT (EDS) PROCESS DERIVED NAPHTHAS Interim Report
G. Tan and A. J. DeRosset Feb. 1979 48 p refs
(Contract EF-77-C-01-2566)
(FE-2566-25) Avail: NTIS HC A03/MF A01

Exxon donor solvent (EDS) process naphtha which was processed in research pilot plants into 100 octane motor fuel by conventional refinery processes, using commercial UOP catalysts is described. The naphtha comprises principally cyclic hydrocarbons. In addition, it contains over 10 percent heterocyclic structures, such as phenols, pyridines, and thiophenes. Hydrotreatment was effective in reducing the sulfur and nitrogen to levels acceptable for reforming. Reforming the hydrotreated naphtha gave 90 volume percent of 100 octane gasoline. DOE

N80-22520# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF COMBUSTION DATA TO UTILIZE LOW-Btu GASES AS INDUSTRIAL PROCESS FUELS. PROJECT 61004 SPECIAL REPORT NO. 8: BOILER BURNER
R. T. Waibel and E. S. Fleming May 1979 40 p refs
(Contract EX-76-C-01-2489)
(FE-2489-45) Avail: NTIS HC A03/MF A01

Data were gathered to determine the performance of a boiler burner with a gun-type fuel injector when retrofit with three low-Btu gases, the performance of natural gas was used as a base line for comparison. The burner was fired on the IGT pilot-scale test furnace, simulating one burner in a multiburner array of an industrial boiler. In order to fire the low-Btu gases at the 3.0 million Btu/hr rate and upstream pressure of 30 psia used for natural gas, the fuel injector was modified by increasing the sizes of the fuel orifices to permit delivery of the required fuel volume at sonic velocity. With the appropriate fuel injector, all the low-Btu fuels exhibited stable flames at fuel enthalpy inputs of 3.0 million Btu/hr. All the low-Btu fuel gases had longer flame lengths than natural gas, although not long enough to create flame impingement problems. The thermal efficiencies of the low-Btu gases ranged from 29.5 percent for Koppers-Totzek oxygen to 26 percent for Winkler air compared with 32 percent for natural gas. DOE

N80-22521# Engineering Societies Commission on Energy, Inc., Washington, D. C.
GUIDELINES FOR ECONOMIC EVALUATION OF COAL CONVERSION PROCESSES Final Report
Apr. 1979 83 p refs
(Contract EF-77-C-01-2468)
(FE-2468-44) Avail: NTIS HC A05/MF A01

Guidelines developed for use in preparing and reporting engineering designs, cost estimates, and financial analyses of large scale fossil energy facilities are presented, primarily for the preliminary economic analysis of coal conversion projects, producing either gas or coal liquids. In a preliminary estimate, the process, equipment, and site factors are sufficiently defined to justify a preliminary engineering design. However, the general structure and subject matter of these guidelines are applicable to either more simplified or more detailed analyses of energy facilities. Particular emphasis is placed on the treatment of capital cost estimates of new processes at various stages of technical development. Also, the financial methods and parameters to be used in determining the required selling price of products are defined in order to establish a base case for sensitivity analysis of technical, locational, or financial variables. DOE

N80-22522# Institute of Gas Technology, Chicago, Ill.
EQUILIBRIUM EFFECTS IN HIGH-PRESSURE HYDROGEN PRODUCTION FROM THERMOCHEMICAL WATER-SPLITTING CYCLES
James D. Schreiber, Jim R. Dafler, and Stephen E. Foh 1978 19 p refs Presented at 2d World Hydrogen Energy Conf., Zurich, 21 Aug. 1978
(Contract EC-77-C-02-4434)
(CONF-780807-8) Avail: NTIS HC A02/MF A01

A group of generalized relationships are presented for hydrogen production steps such that delta G the Gibb's free energy change for the reactions, a series of relationships between the hydrogen mole fraction and product pressure are defined. The trade-offs between product stream composition and input heat temperature are assessed. The degree to which feed stream impurities can be tolerated, given fixed operating variables, can also be determined. DOE

N80-22523# Katzen (Raphael) Associates, Cincinnati, Ohio.
GRAIN MOTOR FUEL ALCOHOL TECHNICAL AND ECONOMIC ASSESSMENT STUDY
Jun. 1979 368 p refs
(Contract EJ-78-C-01-6639)
(HCP/J6639-01) Avail: NTIS HC A16/MF A01

The technical and economical feasibility for production of motor fuel alcohol from a plant with a capacity of 50 million US gallons per year is evaluated. Included are a detailed process design using proven technology, a complete budget estimate of the plant investment including working capital, a detailed analysis of the annual operating cost using corn as the primary feedstock, and a complete financial analysis which establishes the alcohol selling price required to net to the investor a 15 percent discounted cash flow (interest rate or return). Other considerations for production of motor fuel alcohol are evaluated and discussed, namely: excursions on plant capacities; excursions on feedstock material; sensitivity analyses on financial parameters; and substitution of corn stover for coal as the fuel source. An assessment and commmentary on the agricultural, technological, and economic impact of a major gasohol program in the US are also given. DOE

N80-22524# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SURVEY OF BIOMASS GASIFICATION. VOLUME 2: PRINCIPLES OF GASIFICATION
T. B. Reed, comp. Jul. 1979 241 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-33-239-Vol-2) Avail: NTIS HC A11/MF A01

Biomass gasification and associated technologies are surveyed. The technical background necessary for understanding the science, engineering, and commercialization of biomass is presented. DOE

N80-22525# Technische Hochschule, Aachen (West Germany). Inst. fuer Eisenhuettenkunde.
PRESSURE-CHANGE UNDERGROUND GASIFICATION: THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF GASIFICATION Final Report
Christian Paul Beckervordersandforth, Jochen Belzer, Manfred Kuehn, Mehrdat Mohtadi, Wolfgang Sitte, Guenther Subklew, and Walter Terschueren Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1979 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-05) Avail: NTIS HC A05/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 19,10

The extraction of SNG, reduction gas, and other gaseous fuels by means of in situ coal gasification with hydrogen, air, and oxygen mixtures was studied both theoretically and experimentally. Special emphasis was placed on the pressure-change process. Simulation experiments were carried out above ground at pressures up to 60 bar and temperatures up to 1000 C. A feasibility study was performed taking into account technical and economic factors. Author (ESA)

N80-22526# Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey (England).
A CHEMILUMINESCENCE STUDY OF OXIDES OF NITROGEN EVOLVED FROM PROPELLANTS
I. G. Wallace, R. J. Powell, and B. J. Downes London HMSO Sep. 1979 21 p Presented at 5th Symp. on Chem. Probl. Related to the Stability of Explosives, Baastad, Sweden, May 1979
(PERME-TR-146; BR70270) Avail: NTIS HC A02/MF A01

A chemiluminescence NO sub x analyzer was used to study nitrogen oxides evolution from single base and double base propellants. The technique illustrates the importance of total oxides of nitrogen as a means for determining the rate at which these materials decompose. The potential of the method as a rapid and unambiguous means of assessing factors such as stability and compatibility is evaluated. Author (ESA)

N80-22527# Pullman Kellogg, Houston, Tex.
COAL CONVERSION CONTROL TECHNOLOGY. VOLUME 1: ENVIRONMENTAL REGULATIONS; LIQUID EFFLUENTS Final Report, Apr. 1977 - Nov. 1978
L. E. Bostwick, M. R. Smith, D. O. Moore, and D. K. Webber Oct. 1979 540 p
(Contract EPA-68-02-2198)
(PB80-126469; EPA-600/7-79-228A-Vol-1) Avail: NTIS HC A23/MF A01 CSCL 13B

Environmental regulations for gaseous, liquid, and solid wastes, and the control technology for liquid effluents are addressed. Available and developing control technology was evaluated in view of federal, state, regional, and international environmental standards. GRA

N80-22528# Pullman Kellogg, Houston, Tex.
COAL CONVERSION CONTROL TECHNOLOGY. VOLUME 2: GASEOUS EMISSIONS; SOLID WASTES Final Report, Apr. 1977 - Nov. 1978
L. E. Bostwick, M. R. Smith, and D. K. Webber Oct. 1979 384 p
(Contract EPA-68-02-2198)
(PB80-126477; EPA-600/7-79-228B-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 13B

The control technology of gaseous emissions and solid wastes is discussed. Available and developing control technology was evaluated in view of the requirements of federal, state, regional, and international environmental standards. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-22529 Missouri Univ., Rolla.
BEHAVIOR OF ELASTIC AND INELASTIC THREE-DIMENSIONAL BUILDING SYSTEMS FOR STATIC LOADS AND MULTICOMPONENT EARTHQUAKES Ph.D. Thesis
Prasert Kitipitayangkul 1979 394 p

Avail: Univ. Microfilms Order No. 8008399

The effect of interacting three dimensional ground motions on the response behavior of elastic and inelastic building systems is investigated. The structures are subjected to simultaneous input of static loads and multicomponent earthquake motions. The earthquake inputs are applied in any direction of the structural plane. The P-delta effect of the second-order moment resulting from the gravity load and the vertical ground motion is considered. A total of 26 numerical examples are investigated for various low rise and high rise building systems subjected to various loading cases of interacting ground motions. The response parameters of main interest are: (1) transverse, vertical, and torsional movements, (2) internal moments and their associated rotations; (3) energy absorption characteristics; (4) ductility factors and the excursion ratios; (5) the effect of different earthquakes; and (6) the effect of materials having different strain hardenings. Dissert. Abstr.

N80-22530 Illinois Univ. at Urbana-Champaign.
SIMPLE AND COMPLEX MODELS FOR NONLINEAR SEISMIC RESPONSE OF REINFORCED CONCRETE STRUCTURES Ph.D. Thesis
Mehdi Saiidi/Movahhed 1979 200 p
Avail: Univ. Microfilms Order No. 8009156

A total of eight small scale ten story reinforced concrete test structures was analyzed using the Q-Model, and the results were compared with measured responses. The performance of the Q-Model was also examined for different earthquake records. Because no experimental result was available for these records, the calculated responses were checked against the results from the multidegree analytical model developed in the first part of this study. The overall performance of the Q-Model was satisfactory for different structures and earthquake records. Dissert. Abstr.

N80-22531 Illinois Univ. at Urbana-Champaign.
STATISTICAL ANALYSIS OF THE RESPONSE OF NONLINEAR SYSTEMS SUBJECTED TO EARTHQUAKES Ph.D. Thesis
Rafael Riddell 1979 312 p
Avail: Univ. Microfilms Order No. 8009144

The dynamic response of single degree of freedom nonlinear systems subjected to earthquake excitations is considered with the purpose of reviewing previous recommendations for deriving inelastic design spectra, and to evaluate the effect of damping combined with nonlinear behavior and the influence of the type of material nonlinearity on inelastic response. Three nonlinear models are used: the elastoplastic and bilinear idealizations, and a stiffness degrading model. Considering the various conditions and ground motions used, results for about 12,000 different cases are obtained and summarized in the form of inelastic response spectra. A statistical procedure is developed to analyze the data; from this analysis, factors for deriving the characteristic trapezoidal design spectrum are obtained. Such factors reflect, in an explicit manner, the effect of the damping factor and the type of material nonlinearity on inelastic response.Dissert. Abstr.

N80-22532 Illinois Univ. at Urbana-Champaign.
RESPONSE OF SIMPLE STRUCTURAL SYSTEMS TO TRAVELING SEISMIC WAVES Ph.D. Thesis
James Richard Morgan 1979 125 p
Avail: Univ. Microfilms Order No. 8009114

The dynamic response of a simple structural system with coupled translational and rotational degrees-of-freedom subjected to ground motion containing both translational and rotational components was studied to assess current building code procedures and arrive at bounds on the interrelationships between torsional and translational response. A discussion of various system parameters (coupled or uncoupled system, ratio of translational to torsional frequencies, magnitude of eccentricity between centers of mass and stiffness, ratio of translational stiffnesses, and building size) on the interaction between translation and rotation is presented. Tau-averaging was employed in the study. Comparisons of the results of the calculations with results obtained using current seismic building code approaches for buildings with real and accidental eccentricities are presented and discussed. Dissert. Abstr.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N80-22533 Connecticut Univ., Storrs.
THE EFFECT OF THE KERR METRIC ON THE PLANE OF POLARIZATION OF AN ELECTROMAGNETIC WAVE Ph.D. Thesis
Frederick Sun On Su 1979 108 p
Avail: Univ. Microfilms Order No. 8008693

The rotation of the plane of polarization for linearly polarized light rays propagating past a rotating massive body was examined. Two observers in different reference frames were utilized to observe the results for a special class of trajectories: those propagating parallel to the symmetry axis of the body. It is shown that the values for the change in polarization for the global inertial observer differ from that seen by the locally nonrotating observer. It is also shown that this class of trajectories exhibit maximal values - larger than what has been published before. Dissert. Abstr.

N80-22534 Illinois Univ. at Urbana-Champaign.
PERFORMANCE ANALYSIS OF DIRECT-SEQUENCE SPREAD-SPECTRUM MULTIPLE-ACCESS COMMUNICATION VIA FADING CHANNELS Ph.D. Thesis
David Edward Borth 1979 188 p
Avail: Univ. Microfilms Order No. 8008984

The channels considered are those for which the channel output consists of a strong stable specular signal plus a faded version of this signal. Such channels are the result of a transmission medium which gives rise to a major stable communication path and a number of additional weaker communication paths. The fading channel is modeled as a general wide-sense-stationary uncorrelated-scattering (WSSUS) channel - a model which is general enough to exhibit both time and frequency selectivity and to impose no restrictions on the fading rate. A discussion of the important parameters of the WSSUS channel is given and two important classes of WSSUS channels are developed from the general fading channel model: time-selective fading channels and frequency-selective fading channels. In analyzing the performance of direct-sequence SSMA communications via fading channels, two measures of system performance that are considered are average signal-to-noise ratio at the receiver output and the average probability of error. Dissert. Abstr.

N80-22535 Rutgers - The State Univ., New Brunswick, N. J.
ANALYSIS AND DESIGN OF HIGHLY DECOUPLED COLINEAR ANTENNAS Ph.D. Thesis
Donn VanDyke Campbell 1979 173 p
Avail: Univ. Microfilms Order No. 8008862

In communication systems used for simultaneous transmission and reception on adjacent frequencies cross-talk interference often occurs as a result of the strong mutual coupling of the collocated transmitting and receiving antennas. To solve this problem, a colinear antenna array consisting of two independently fed vertical half wavelength dipoles and a feed line 'isolator section' was designed. The colinear antenna arrangement minimizes radiation coupling. The isolator section, which is a new concept, practically eliminates parasitic currents induced on the outer surface of the feed line connected to the upper dipole. As a result, the inter-dipole coupling is greatly reduced and the dipoles operate independently and as if the feed line were not present. Moreover, field pattern distortion is practically eliminated since the feed line does not contribute to the antenna radiation. Dissert. Abstr.

N80-22536 Rutgers - The State Univ., New Brunswick, N. J.
A MICROWAVE RESONATOR AND CAVITY-BACKED SLOT ANTENNA BASED UPON THE GAUSSIAN BEAM MODES OF RECTANGULAR SYMMETRY Ph.D. Thesis
Charles Michael 1979 234 p
Avail: Univ. Microfilms Order No. 8008872

Gaussian beams, such as those produced in a laser, are characterized by cross-sectional field distributions which decay

rapidly away from the beam axis. The fields of the beam modes possessing rectangular symmetry are expressed in terms of a complete, orthogonal set of functions, the Gauss-Hermite polynomials. These functions exhibit extremely rapid decay transverse to the beam axis, a feature which eliminates the need for field confinement to the sides, as is required in conventional microwave structures such as waveguides, resonators, and horn antennas. Design formulas for a microwave resonator are developed in terms of these beam modes and an experimental cavity with a quality factor, Q, greater than 12,000 is described. A slot aperture is formed in one wall of the cavity to produce radiation into space. The field distribution of the finite length aperture is shown to have a Gaussian distribution in the transverse dimension in very good approximation and the radiation field due to this aperture distribution is calculated using the Fourier transform. Dissert. Abstr.

N80-22537 Illinois Univ. at Urbana-Champaign.
INTERACTIVE FACSIMILE COMMUNICATION TECHNIQUES Ph.D. Thesis
Andrew Burton White 1979 109 p
Avail: Univ. Microfilms Order No. 8009207

Graphic communication systems for technical teleconferencing are examined. The responses to a questionnaire sent to the participants in a recent teleconference are reported. The results of this survey indicate effective technical teleconferences can be conducted with a two way voice channel, an image handling system, and a remote pointer. The results confirm that a cursor would be a useful addition to conversations involving graphics. Taped technical presentations are presented which show that both voice and nonverbal data can be combined on a single digital voice channel. To transmit the cursor information a new technique was developed that inserts this data at zero crossing in the voice waveform. The development of electronic hardware devices is also addressed. Dissert. Abstr.

N80-22538 Illinois Univ. at Urbana-Champaign.
ELASTIC WAVE PROPAGATION IN RODS AND BARS Ph.D. Thesis
Thomas Roger Woodley 1979 95 p
Avail: Univ. Microfilms Order No. 8009217

The results of a literature search on the facts contained in the studies of classical problems of traveling waves in rods of circular cross section and rectangular bars are presented. The derivation of the equations of motion, boundary conditions, frequency equations, phase and group velocities, the rigid body motions associated with zero frequency solutions, and asymptotic solutions were assembled. During the investigation, new axial shear solutions for rectangular bars and a set of new frequency equations were discovered. Dissert. Abstr.

N80-22539 Wyoming Univ., Laramie.
THE HYPERBOLIC WAVE THEORY OF FIRST-ORDER PHASE TRANSITIONS Ph.D. Thesis
Rodney William Cole 1978 134 p
Avail: Univ. Microfilms Order No. 8008006

A hyperbolic wave theory is developed and used to describe the catastrophe in the equation of state for systems exhibiting firts-order phase transitions. From the grand canonical ensemble a Burgers equation for the order parameter is derived in the state variables T and nu (temperature and chemical potential). It is found that both shock solutions consistent with the Maxwell equal-area construction and breaking solutions are predicted by this equation and that without stability requirements the grand canonical ensemble does not contain enough information to uniquely determine the solution. Entropy conditions are derived to uniquely determine the shock solution in the coexistence region. It is found that owing to the divergence of the correlation length and relaxation time, the concept of quasistatic change is not valid in the coexistence region, and that a nonequilibrium description must, therefore, be used. Dissert. Abstr.

N80-22540 Arizona State Univ., Tempe.
RADAR SIGNAL CORRELATION SIDELOBE SUPPRESSION USING WALSH TECHNIQUES PH.D. Thesis
Charles Edward Steuck 1979 231 p
Avail: Univ. Microfilms Order No. 8008583

Correlation sidelobe suppression in radar signal processing is considered. Certain binary valued sequences such that Walsh function analysis could be used to simplify the hardware are introduced. After a short treatment of binary valued Walsh functions, Woodward's ambiguity function is used to look at some of the problems that might arise from actually trying to use the proposed scheme. Also, binary valued sequences are extended to quanternary valued sequences that take on only the values + or -1 and + or -j. The results are similar for both the binary valued and the quanternary valued sequences. Problems associated with resolving multiple targets that have a wide separation in Doppler and the potential for resolving multiple targets in range only are considered. Dissert. Abstr.

N80-22541 California Univ., Los Angeles.
THEORY AND DESIGN OF PRINTED ANTENNAS Ph.D. Thesis
Inam Elahi Rana 1979 167 p
Avail: Univ. Microfilms Order No. 8008515

The theory and design of antennas printed on a grounded substrate was studied. A Green's function approach was employed. By considering Pocklington's integral equation with proper choice of expansion and testing functions, solutions for current distribution and input impedance were obtained. As an example, printed wire antenna was analyzed. Numerical results illustrating the effect of substrate thickness and dielectric constant on the current distribution and input impedance are presented. An array of printed wire dipoles was also considered. Dissert. Abstr.

N80-22542 Illinois Univ. at Urbana-Champaign.
ALUMINUM GALLIUM ARSENIDE/GALLIUM ARSENIDE HETEROJUNCTION PHOTOTRANSISTORS FOR FIBEROPTIC COMMUNICATIONS Ph.D. Thesis
Raymond Anthony Milano 1979 114 p
Avail: Univ. Microfilms Order No. 8009108

The operation of heterojunction phototransistor (HPT's) was investigated. It is shown that the device can provide high gain and fast response. The gain depends on base width, minority carrier diffusion length in the base, and the difference in bandgap energies between emitter and base. The frequency response of the heterojunction phototransistor was analyzed. The response time is shown to depend on the response of the base-emitter potential, to changes in optical input signal. The performance of the device as a detector for fiber optic communication systems was also analyzed. Theoretical calculations show that the base current and load resistance limit the HPT to applications in which moderate to high signal power is available. Heterojunction phototransistors fabricated by metalorganic chemical vapor deposition were experimentally characterized by measurements of the dc and small signal optical gain, the spectral response, and the response time. Results show that the MO-CVD fabricated devices are comparable to the best devices fabricated by liquid phase epitaxy. Dissert. Abstr.

N80-22543*# Future Systems, Inc., Gaithersburg, Md.
AN ADVANCED DOMESTIC SATELLITE COMMUNICATIONS SYSTEM
Mar. 1980 205 p refs
(Contract NASw-3300)
(NASA-CR-163004; FSI-242) Avail: NTIS HC A10/MF A01 CSCL 17B

An updated traffic projection for U.S. domestic satellite communications service covering a period of 15 years; mid-1980 to mid-1995 was prepared. This model takes into account expected technology advances and reductions in transmission costs, legislative and regulatory changes permitting increased competition, and rising energy costs which will encourage more extensive substitution of telecommunications for travel. The historical development and current status of satellite systems are discussed as well as the characteristics of follow-on systems. Orbital arc utilization, spacecraft configuration for single shuttle launch, Earth station configuration, and system costs are examined. Areas which require technology development include multiple beam frequency reuse antennas, on-board switching, intersatellite links, and ka-band operation. Packing and deployment schemes for enclosing the satellite within the shuttle orbiter bay must also be devised. A.R.H.

N80-22544*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STUDY OF WRAP-RIB ANTENNA DESIGN Final Report
W. D. Wade, A. Sinha, and R. Singh 12 Dec. 1979 85 p
(Contracts NAS7-100; JPL-955345)
(NASA-CR-162929; LMSC-D714613) Avail: NTIS HC A05/MF A01 CSCL 09C

The results of a parametric design study conducted to develop the significant characteristics and technology limitations of space deployable antenna systems with aperture sizes ranging from 50 up to 300 m and F/D ratios between 0.5 and 3.0 are presented. Wrap/rib type reflectors of both the prime and offset fed geometry and associated feed support structures were considered. The significant constraints investigated as limitations on achievable aperture were inherent manufacturability, orbit dynamic and thermal stability, antenna weight, and antenna stowed volume. A data base, resulting in the defined maximum achievable aperture size as a function of diameter, frequency and estimated cost, was formed. E.D.K.

N80-22545*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
ULTRAMICROWAVE COMMUNICATIONS SYSTEM, PHASE 2 Final Report
5 Jan. 1980 33 p refs
(Contract NAS9-15617)
(NASA-CR-160573; MDC-E2209) Avail: NTIS HC A03/MF A01 CSCL 17B

Communications system design was completed and reviewed. Minor changes were made in order to make it more cost effective and to increase design flexibility. System design activities identified the techniques and procedures to generate and monitor high data rate test signals. Differential bi-phase demodulation is the proposed method for this system. The mockup and packaging designs were performed, and component layout and interconnection constraints were determined, as well as design drawings for dummy parts of the system. The possibility of adding a low cost option to the transceiver system was studied. The communications program has the advantage that new technology signal processing devices can be readily interfaced with the existing radio frequency subsystem to produce a short range radar. E.D.K.

N80-22546# Communications Research Centre, Ottawa (Ontario). Radio and Radar Research Branch.
THE GREAT LAKES PROPAGATION MEASUREMENT PROGRAM: COMPARISONS OF THE CANADIAN DATA WITH THE PREDICTIONS OF FCC R-6602
F. H. Palmer Feb. 1980 67 p refs
(CRC-1332) Avail: NTIS HC A04/MF A01

It was found that there was insufficient propagation data to determine reliably either the interference levels that would be encountered, or the applicability of the existing FCC R-6602 propagation curves, in the region of the Great Lakes. Accordingly, it was decided to conduct a joint study to assess, and if possible resolve, the propagation issues. Attention is confined to comparisons of observed field strengths in the Great Lakes area with those predicted by R-6602, and to an interpretation of the differences in terms of various paths and systems parameters. It is shown that, while the R-6602 curves accurately predict the long term (annual average) values of F(50,50) and F(50,10), they do not take into account observed diurnal and seasonal variatons of signal strengths of up to about 30 dB. Qualitatively, signal strengths over all paths are found to be higher at night than during the day and higher in summer than in winter. Empirical expressions are presented which relate the signal strengths predicted by R-6602 to those actually observed, and which take into account time of day, day of year, path length, and percentage of propagation path covered by water. F.O.S.

N80-22547*# Western Union Telegraph Co., Upper Saddle River, N.J.
THE 18/30 GHz FIXED COMMUNICATIONS SYSTEM SERVICE DEMAND ASSESSMENT. VOLUME 1: EXECUTIVE SUMMARY
t. Gabriszeski, P. Reiner, J. Rogers, and W. Terbo Jun. 1979 32 p 3 Vol.
(Contract NAS3-21359)
(NASA-CR-159546) Avail: NTIS HC A03/MF A01 CSCL 17D

The total demand for voice, video, and data communications services, and satellite transmission services at the 4/6 GHz, 12/14 GHz, and 18/30 GHz frequencies is discussed. Major study objectives, overall methodology, results, and general observations about a satellite systems market characteristics and trends are summarized. M.G.

N80-22548*# Western Union Telegraph Co., Upper Saddle River, N.J.
THE 18/30 GHz FIXED COMMUNICATIONS SYSTEM SERVICE DEMAND ASSESSMENT. VOLUME 2: MAIN TEXT
T. Gabriszeski, P. Reiner, J. Rogers, and W. Terbo Jun. 1979 328 p refs 3 Vol.
(Contract NAS3-21359)
(NASA-CR-159547) Avail: NTIS HC A15/MF A01 CSCL 17B

The total demand for communications services, and satellite transmission services at the 4/6 GHz, 12/14 GHz, and 18/30 GHz frequencies is assessed. The services are voice, video, and data services. Traffic demand, by service, is distributed by geographical regions, population density, and distance between serving points. Further distribution of traffic is made among four major end user groups: business, government, institutions and private individuals. A traffic demand analysis is performed on a typical metropolitan city to examine service distribution trends. The projected cost of C and Ku band satellite systems are compared on an individual service basis to projected terrestrial rates. Separation of traffic between transmission systems, including 18/30 GHz systems, is based on cost, user, and technical considerations. M.G.

N80-22549*# Western Union Telegraph Co., Upper Saddle River, N.J.
THE 30/20 GHz FIXED COMMUNICATIONS SYSTEMS SERVICE DEMAND ASSESSMENT. VOLUME 3: APPENDICES
T. Gabriszeski, P. Reiner, J. Rogers, and W. Terbo Jun. 1979 200 p refs 3 Vol.
(Contract NAS3-21359)
(NASA-CR-159548) Avail: NTIS HC A09/MF A01 CSCL 17B

The market analysis of voice, video, and data 18/30 GHz communications systems services and satellite transmission services is discussed. Detail calculations, computer displays of traffic, survey questionnaires, and detailed service forecasts are presented. M.G.

N80-22550# California Univ., Berkeley. Electronics Research Lab.
SUPERCONDUCTING WEAK LINKS FOR MIXING AT MILLIMETER-WAVE FREQUENCIES Final Report, 15 May 1973 - 30 Sep. 1979
T. VanDuzer Sep. 1979 11 p refs
(Grants DA-ARO(D)-31-124-73-G165; DAAG29-76-G-0191) (AD-A080571; ARO-11796.4-EL; ARO-13678.4-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

A study is made for application of Josephson devices for millimeter-wave mixing. Technology for fabrication of small area silicon-coupled sandwich-type Josephson junctions is developed. A thin strip of superconducting metal film deposited on a degenerately doped silicon surface with a 0.1 - 0.3 micron gap cut across the film is shown to constitute a Josephson junction with certain significant advantages. A design of a Josephson junction two-dimensional array is made and its properties are studied theoretically. A model for calculation of the action of a developer on a resist is devised. Calculations of the effect of thinning a substrate on the exposure of electron resists are made. GRA

N80-22551# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A TEST FOR THE VALIDITY OF THE GENERALIZED GILBERT MODEL USING REAL COMMUNICATIONS CHANNELS M.S. Thesis

John F. Johnson, Jr. Dec. 1979 170 p refs
(AD-A080370; AFIT/GE/EE/79-18) Avail: NTIS
HC A08/MF A01 CSCL 17/2

A proposal has been made to use the generalized Gilbert model in a real time channel monitoring device. The purpose of the device is to calculate error statistics by observing an operational channel and, from the observations, estimate the model parameters. The parameter estimates can then be used to calculate the desired channel statistics. An estimator is developed which yields these parameters. The estimator and the model are tested using real communications channels. The model and/or estimator are found to be invalid when applied to the channel data available. A sensitivity analysis is conducted using the probability equations associated with the model. The sensitivity study indicates that the parameters of the generalized Gilbert model cannot be uniquely, simultaneously estimated from observations of the data. Author (GRA)

N80-22552# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THRESHOLD OF THE VELOCITY GATE IN A CONTINUOUS WAVE RADAR WITH CONICAL SCAN TRACKING M.S. Thesis
Jonathan Paul Sumray Dec. 1979 101 p refs
(AD-A080411; AFIT/GE/EE/79-35) Avail: NTIS
HC A06/MF A01 CSCL 17/9

A study is made of the behavior of the velocity gate in a continuous wave radar with conical scan tracking. Adapting the analysis of the frequency modulation feedback demodulator (FMFB), two linear models are developed for the velocity gate. The first deals with the gate's response to a static doppler frequency offset and the second deals with its response to a varying doppler frequency. The dynamic model also incorporates the presence of narrowband, Gaussian noise at the input to the gate. The phase tracking error of the gate due to noise is determined as a function of the carrier-to noise ratio (CNR) in a bandwidth equal to the closed-loop noise bandwidth. Establishing the performance criterion to be the frequency tracking error, two definitions for the threshold of the gate are established. The first states the threshold occurs at the value of CNR for which the root-mean-square frequency tracking error due to noise exceeds half the 3db bandwidth of the IF filter within the gate. The second bases the threshold on the probability of the frequency error exceeding half the 3db bandwidth of the IF filter. Both definitions are applied to an example in which a second order velocity gate is considered. GRA

N80-22553# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PREDICTED MICROWAVE ELCTROMAGNETIC BACKSCATTERING RETURNS FOR SIMPLE REFLECTIVE TARGETS M.S. Thesis
Frank DiBartolomeo, Jr. Dec. 1979 123 p refs
(AD-A080367; AFIT/GE/EE/79D-11) Avail: NTIS
HC A06/MF A01 CSCL 17/9

The problem of identifying the perfectly conducting sphere and the perfectly conducting, infinitely thin circular disk via the backscattered far field from the object with a known incident signal is examined. A method utilizing synthetic aperture radar principles to obtain slant range versus cross range image plots of the discrete point scatterers on an object is discussed. A computer program to calculate the far field backscattering from the sphere is developed. Another computer program, found in the literature, which calculates the far field backscattering from the infinitely thin circular disk, is extended for ka = or > 15. In the above programs, the backscattering is obtained as a function of frequency and treated as the frequency response of a linear system. The input to this system is 5 cycles of 10 GHz R-F. The return signal is the output of the system and is obtained by using conventional linear system theory. Since a sphere is symmetric, the same return is obtained at all aspect angles. This return is examined. However, returns from the circular disk are different at different aspect angles. These returns from the disk are examined. GRA

N80-22554# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PULSE-WIDTH MODULATION OF SPREAD SPECTRUM CARRIERS M.S. Thesis
Frank Davis Tiller Dec. 1979 121 p refs
(AF Proj. 2277)
(AD-A080158; AFIT/GE/EE/79-39) Avail: NTIS
HC A06/MF A01 CSCL 17/2

Spread spectrum techniques can produce results in communication and navigation systems that are not possible with standard signal formats. The results of particular interest are the ability to screen messages from eavesdroppers, high resolution ranging and the rejection of interference. Three modulation schemes that exploit these spread spectrum properties are analyzed in this thesis. All three techniques use pulse-width modulation to encode sampled analog voice signals onto a digital phase coded carrier. The performance analysis assumes transmission in the presence of white Gaussian noise and CW jamming. The performance analysis uses maximum likelihood estimation to define the sample parameter estimate and associated error variance when probability density functions can be defined for the receiver sample outputs. When the density function is not available a second moment analysis is used to define the expected signal-to-noise ratio. The results are extended to include the introduction of signal dependent code noise into the receiver resulting from the degradation of the orthogonal code word structure. The impact of code noise on system performance is seen to grow with the number of users squared and the received signal energy. GRA

N80-22555# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ADAPTIVE ARRAY WITH AUTOMATIC GAIN CONTROL M.S. Thesis
John Rodgers Sutton Dec. 1979 98 p refs
(AD-A080374; AFIT/GE/EE/79-36) Avail: NTIS
HC A05/MF A01 CSCL 17/4

A three-element adaptive array algorithm with Applebaum-Howells loops combined with a linear automatic gain control (AGC), was analyzed. Computer simulations of array performance for signal jammers were presented and analyzed. Jammer scenarios included were: narrowband and broadband, high power, centered and non-centered jammers about the array center frequency, and different automatic gain control response times. No fixed performance criteria were applied to SNR degradation and antenna pattern plots. A non-linear AGC was linearized by expanding the exponential attenuation function in a series and truncating the higher-order terms. The AGC is shown to destroy the typical monotonically decreasing SNR degradation of a constant power, narrow band jammer when its response time is near that of the adaptive loop. Simulation results show that an AGC can cause the adaptive weight amplitudes to vary significantly. GRA

N80-22556# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
INTERCEPT VULNERABILITY OF DIRECT SEQUENCE PSEUDO-NOISE ENCODED SPREAD SPECTRUM WAVEFORMS M.S. Thesis
Thomas J. Hall Dec. 1979 119 p refs
(AD-A080213; AFIT/GE/EE/79-15) Avail: NTIS
HC A06/MF A01 CSCL 17/4

Direct sequence pseudo-noise (PN) encoded spread spectrum (SS) waveforms are examined for their vulnerability to intercept and message reconstruction without knowledge of the PN code used. Two generic modulation formats are described and an intercept receiver model is proposed. Receiver outputs are calculated and it is shown that message reconstruction is possible for both generic modulation formats under appropriate conditions. GRA

N80-22557# Naval Ocean Systems Center, San Diego, Calif.
HF SKYWAVE COMMUNICATIONS TEST PLAN
G. P. Francis Nov. 1979 29 p refs
(AD-A080165; NOSC/TD-309) Avail: NTIS
HC A03/MF A01 CSCL 17/2

The report describes a test to develop a data base that will be used to evaluate and analyze adaptive signal processing algorithms. Both wideband and narrowband data will be transmitted for analysis. The wideband data will be quadrature phase shift keyed. The narrowband data will be quadrature phase

shift keyed, biphase shift keyed, and quadrature differential phase shift keyed. GRA

N80-22558# Houston Univ., Tex. Dept. of Electrical Engineering.
REMOTE LINK UNIT FUNCTIONAL DESIGN: AN ADVANCED REMOTE TERMINAL FOR MIL-STD-1553B Interim Report, 2 Oct. 1978 - 31 Aug. 1979
Carlos J. Tavora, John R. Glover, Jr., and George W. Batten Oct. 1979 225 p
(Contract F33615-78-C-1634; AF Proj. 2003)
(AD-A080126; AFAL-TR-79-1176) Avail: NTIS HC A10/MF A01 CSCL 17/2

This report presents a functional design of the Remote Link Unit (RLU). The RLU is an intelligent remote terminal which is compatible with hierarchical distributed processing. It has interface modules capable of processing subsystem data on-the-fly and supporting a universal signal interface which can be configured under software control to input or output analog and digital signals of varied types. Electronic nameplates containing identification, interface requirements and signal processing programs are attached to avionics subsystems to support the RLU operational features. The RLU stand-alone processing capabilities provide fault tolerance and facilitate maintenance.
Author (GRA)

N80-22559# Aeronautical Research Associates of Princeton, Inc., N. J.
THE DEVELOPMENT AND TESTING OF AN ULTRAVIOLET VOICE COMMUNICATION SYSTEM Final Report, Jun. 1978 - Jul. 1979
Michael E. Neer and Joseph M. Schlupf Jul. 1979 173 p refs
(Contract N66001-78-C-0180)
(AD-A080319; ARAD-394) Avail: NTIS HC A08/MF A01 CSCL 17/2

Measurements of the atmospheric propagation and scattering of ultraviolet radiation within the solar blind through the lower atmosphere have been made through the summer and fall months of 1978 in rural, industrial and maritime atmospheres. An ultraviolet propagation and scattering model has been improved as the result of these measurements and has been used successfully in an ultraviolet communications model. A research oriented, ultraviolet voice communications system has been designed and fabricated using the best available components. The communications system has been field tested and found to perform quite well with a maximum line of sight range of 4.7 km and maximum nonline of sight range of 1.6 km when the ozone level is moderately high. Several advances have been made in component design including triggering circuitry for the high repetition rate flashlamps, voice modulation electronics, pulse amplitude discriminator design, and the collimation of transmitted radiation. Investigations of multi-channel concepts and safety have also been completed. GRA

N80-22560# Naval Weapons Center, China Lake, Calif. Weapons Dept.
LOW CARRIER-TO-NOISE RATIO RECEPTION OF VIDEO DATA LINK SIGNALS: A LABORATORY INVESTIGATION Interim Report
W. H. Woodworth Aug. 1979 21 p
(WF32300000)
(AD-A080304; NWC-TP-6129) Avail: NTIS HC A02/MF A01 CSCL 17/2

Techniques involving analog pre-transmisson signal processing, wide deviation phase modulation, coherent detection, and field-rate recursive video filtering are combined into a transmission system capable of operating at carrier-to-noise ratios as low as -10 to -17 dB, depending on the type of noise or interference. System design concepts, test results, and planned improvements are described in detail. GRA

N80-22561# Teledyne Micronetics, San Diego, Calif.
ADVANCED RADAR DETECTION AND PROCESSING TECHNIQUES FOR LOW ELECTROMAGNETIC SCATTERING TARGETS Final Report, 19 May 1978 - 19 May 1979
Lee A. Morgan and Steven Weisbrod Sep. 1979 43 p
(Contract F30602-78-C-0163; AF Proj. 2314)
(AD-A080189; R19-79; RADC-TR-79-244) Avail: NTIS HC A03/MF A01 CSCL 17/9

Radar cross section measurements were made on Teledyne Micronetics' Radar Range using C-band one nanosecond pulses. The radar target was made up of retrodirective Lunsberg lenses variously deployed on a turntable. The number of lenses varied from two to six. For each deployment of targets, the impulse response was experimentally determined with the help of a sampling scope and the complex conjugate of this impulse response was synthesized using power splitters and delay lines. This signal was then transmitted and the RCS enhancement was measured by reducing the level of the transmitted power until the maximum response was equal to a previously established reference level. Subsequently additional power splitters and delay lines were utilized to synthesize matched receiver response and a similar comparison technique was used to measure the increase in the RCS. The configurations which were tried included equal and unequal spacings and path geometries where the individual reflecting centers were separable and cases where they overlapped. The observed value of RCS enhancement were compared with the theoretical values and it was demonstrated that the agreement between the two values was in general well within one dB.
GRA

N80-22562# Sperry Gyroscope Co., Great Neck, N. Y. Electromagnetic Sciences Div.
COLUMN NETWORK STUDY FOR A PLANAR ARRAY USED WITH AN UNATTENDED RADAR Interim Report
Gerald L. Hanley and Harry R. Perini Dec. 1979 44 p
(Contract F19628-78-C-0166)
(AD-A080566; RADC-TR-79-297) Avail: NTIS HC A03/MF A01 CSCL 17/9

Objectives of this program are to investigate design and fabrication techniques for an azimuthally phase-steerable planar array with dual-beams for elevation coverage. Network costs, network insertion loss, antenna pattern performance, and reliability are significant considerations. A stripline dual beam column network is being designed, fabricated and tested to demonstrate achievable performance and competitive techniques for production and installation costs are being studied. This report summarizes the work completed during the first half of the program: completion of the Antenna Conceptional design, development of all the required components, the design of the dual beam column network, and preliminary results of competitive techniques for production.
GRA

N80-22563# ITT Gilfillan, Inc., Van Nuys, Calif.
POLARIZATION PROCESSING TECHNIQUES STUDY Final Report, Mar. 1978 - Mar. 1979
Albert Klein, David Hammers, Masaaki Fujita, George Ioannidis, Nhan Levan, Jeffery Bell, and Charles Lucas Nov. 1979 150 p refs
(Contract F30602-78-C-0119; AF Proj. 4506)
(AD-A080565; ITTG-9532-F; RADC-TR-79-285) Avail: NTIS HC A07/MF A01 CSCL 17/9

Polarization serves as a discriminant between radar targets and surrounding chaff and clutter. A dual channel system is required to utilize polarization information which exists in the target scattering matrix. Several methods are presented for designing an optimum polarization codes transmit waveform and matched coherent receiver based on target and clutter statistics. Simulation results for various target models against chaff show a significant increase in detectability for the two-channel system. GRA

N80-22564# American Electronic Labs., Inc., Farmingdale, N. J.
ELECTROMAGNETIC RADIATION SYSTEM (EMRS) FOR SUSCEPTIBILITY TESTING Quarterly Report, 1 Oct. - 1 Dec. 1978
Maragaretta V. Stone Fort Monmouth, N.J. Army Commun. Res. and Develop. Command Apr. 1979 15 p
(Contract DAAB07-76-C-0332; DA Proj. 1L7-62701-AH-92)
(AD-A080226; CORADCOM-76-0332-9) Avail: NTIS HC A02/MF A01 CSCL 14/2

The function of the Electromagnetic Radiation System (EMRS) is to generate electromagnetic energy to produce a constant field strength that can be automatically scanned as a function

of frequency. The design objective is to cover the frequency range of 30 hertz to 40 gigahertz with field strength intensities up to 200 volts per meter. This report describes system equipment status and results of performance tests in all demonstration frequency ranges (30-60 MHz, 1.0-2.1 GHz, 2.1-4.0 GHz and 12.4-18.0 GHz). GRA

N80-22565# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ANALYSIS OF A PHASE-LOCKED LOOP AND A GENERAL FEEDBACK SYSTEM WITH A LIMITER Interim Report
H. J. Kushner and Y. Bar-Ness Oct. 1979 46 p refs
(Grant AF-AFOSR-3063-76; AF Proj. 2304)
(AD-A080357; LCDS-TR-79-5; AFOSR-80-0089TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A phase-locked loop (PLL) with a hard limiter and wide-band noise input is analyzed. A powerful method introduced in Kushner's 'Diffusion approximations to output processes of nonlinear systems with wide band inputs, and applications' for obtaining a close diffusion approximation to a system with the limiter greatly improves the tracking and acquisition properties over the classical PLL. This is demonstrated theoretically and supported by simulation results. Similar results hold for a standard feedback control problem with a limiter at the beginning of the forward loop. The results are a clear demonstration of the value of the new techniques of analysis which are employed. The techniques are applicable to other communications systems with nonlinearities and wide-band inputs. GRA

N80-22566# Ohio State Univ., Columbus. ElectroScience Lab.
CHAFF RADAR CROSS SECTION STUDIES AND CALCULATIONS Interim Report, 1 Jan. 1976 - 30 Jun. 1977
R. J. Garbacz May 1978 42 p refs
(Contract F33615-76-C-1024; AF Proj. 7633)
(AD-A080989; ESL-78-4346-7; AFAL-TR-79-1114) Avail: NTIS HC A03/MF A01 CSCL 17/4

The objective of Contract F33615-76-C-1024 has been to analytically and experimentally investigate chaff scattering and the reduction of antenna-related radar cross section. This final report summarizes results obtained during the interim 1 January 1976 through 30 June 1977 on the chaff aspect of the effort. Included are summaries of (1) an investigation of scattering by a long wire excited by either a plane wave or by a nearby short dipole with sinusoidal current distribution and (2) an experimental study of small foam shapes very densely coated with chaff filaments. GRA

N80-22567# SRI International Corp., Menlo Park, Calif.
EXPERIMENTAL STUDY OF THE EFFECTS OF FAULTS ON SPHERICAL WAVE PROPAGATION, PHASE 1 Final Report, 29 Mar. - 30 Sep. 1979
J. C. Cizek, A. L. Florence, D. D. Keough, and J. T. Rosenberg Oct. 1979 35 p refs
(Contract DNA001-79-C-0261; DARPA Order 3749)
(AD-A081080; SRI-PYU-8392) Avail: NTIS HC A03/MF A01 CSCL 08/7

A laboratory technique has been developed for investigating the effect on a spherical wave of a fault located close to a spherical explosive charge that is detonated to generate the wave. The medium is a grout that simulates tuff, the fault is idealized by Mylar sheets, and the sensor is a particle velocity gage. The gage principle is based on Faraday's law in that a voltage is induced in a conducting loop when a moving portion of the loop cuts the flux lines of a magnetic field. A measure of the wave-fault interaction was obtained by comparing records of particle velocity gages engulfed by waves that have not crossed faults with records of gages engulfed by waves that have crossed faults. From these comparisons, it was concluded that the technique is suitable for investigating wave-fault interactions. GRA

N80-22568# Environmental Research and Technology, Inc., Concord, Mass.
AUTOMATIC WEATHER RADAR ECHO ASSESSMENT AND TRACKING Final Report, 15 Feb. - 30 Sep. 1978
Robert K. Crane Hanscom AFB, Mass. AFGL Mar. 1979 140 p refs
(Contract F19628-78-C-0076; AF Proj. 6670)
(AD-A081061; AFGL-TR-79-0248) Avail: NTIS HC A07/MF A01 CSCL 17/9

Previously developed algorithms for automatic radar cell detection and tracking were adapted for real-time use on the AFGL Echo Track and Significance Estimator. Additional significance estimation algorithms were developed to reduce the number of detected cells to a manageable number for display and interpretation. GRA

N80-22569# Oak Ridge National Lab., Tenn. Fusion Energy Div.
DESIGN OF A HYPERBOLIC MICROWAVE METALLIC LENS
T. Uckan Dec. 1979 12 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7060) Avail: NTIS HC A02/MF A01

Problems caused by multiple reflections in the cavity walls of the EBT fusion research device are considered emphasizing the directivity of waves in the millimetric range. Microwave metallic lenses, designed to focus the energy into a plane wave are shown to improve the directivity considerably. By implementing a 70-GHz standard-gain horn with a delay-type hyperbolic lens, which consists of a solid metallic disk with a number of equal size small holes has indicated a gain of 15 dB over the no lens case. DOE

N80-22570# Research Inst. of National Defence, Stockholm (Sweden).
DIFFERENTIAL ABSORPTION LIDAR: EFFECTS OF SPECKLE NOISE
Kjell Oestberg 1979 12 p refs
(FOA-B-30031-E1; ISBN-91-7056-052-8) Avail: NTIS HC A02/MF A01

The difference between direct detection and heterodyne detection with regard to speckle noise is demonstrated. The sensitivity imposed by the speckle noise on a range-resolving differential absorption lidar with heterodyne detection is shown. A formula for the standard deviation of estimated gas concentration is derived. Author (ESA)

N80-22571# European Space Agency, Paris (France).
CALCULATION OF HETERODYNE DETECTION WITH FOCUSED RADIATION
Friedrich Malota Jul. 1979 20 p refs Transl. into ENGLISH of "Berechnungen zum Heterodyne-Empfang mit Fokussierter Strahlung", Rept. DFVLR-FB-78-20 DFVLR, Oberpfaffenhofen, West Germany Original report in GERMAN previously announced as X79-76600
(ESA-TT-552; DFVLR-FB-78-20) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 11.30

The principal problems associated with heterodyne detection when use is made of focused radiation are examined. Focusing the radiation represents one way of attenuating the demands made on the mechanical structure of an installation. Several possible arrangements of this type are explained and the signal-to-noise ratios associated with them are computed. The basis for this computation is constituted by the three-dimensional formulation of the focus region (Lommel-function). The manner in which the signal-to-noise ratio depends on the distance between the detector and the focal plane is investigated, and the results and the limitations of the computational methods are discussed. Author (ESA)

N80-22572# Royal Aircraft Establishment, Farnborough (England).
AN AUTOMATED HF SIGNAL MEASUREMENT SYSTEM
J. E. Pesterfield London HMSO 1979 31 p refs
(Rad-Nav-65; RAE-TR-78132; BR67660) Avail: NTIS HC A03/MF A01

An HF Measurement System at Cobbett Hill Radio Station is described. Measurements of signal strength and error rates of test transmissions made automatically under the control of a PDP8F digital computer are presented. The data are stored and subsequently analyzed to obtain, signal-to-noise, bit error temporal distribution, and fading morphology. Future expansion of the system is discussed and it is concluded that a large reduction

in the workload of station operators and test staff can be realized. Author (ESA)

N80-22573# Royal Aircraft Establishment, Farnborough (England).
A DEVICE FOR TRACKING THE FUNDAMENTAL FREQUENCY OF SPEECH AND ITS APPLICATION IN THE ASSESSMENT OF STRAIN IN PILOTS AND AIR TRAFFIC CONTROLLERS
J. B. Peckham London HMSO May 1979 56 p refs
(RAE-TR-79056; BR69831) Avail: NTIS HC A04/MF A01

The use of speech signals for assessing physiological and psychological changes resulting from strain in pilots and air traffic controllers is discussed. A device is described which tracks the fundamental frequency of the speech signal in order to quantify changes in the parameter due to strain is described. Author (ESA)

N80-22574*# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).
COHERENT GENERATION OF THE TERRESTRIAL KILOMETRIC RADIATION BY NONLINEAR BEATINGS BETWEEN ELECTROSTATIC WAVES
A. Roux and R. Pellat (Ecole Polytechnique, Palaiseau, France) Mar. 1978 34 p refs
(Grant NGL-16-001-043)
(NASA-CR-162869; CRPE-NT-56) Avail: NTIS HC A03/MF A01 CSCL 20N

The propagation of electrostatic plasma waves in an inhomogeneous and magnetized plasma was studied. These waves, which are driven unstable by auroral beams of electrons, are shown to suffer a further geometrical amplification while they propagate towards resonances. Simultaneously, their group velocities tend to be aligned with the geomagnetic field. It is shown that the electrostatic energy tends to accumulate at, or near omega sub LH and omega sub UH, the local lower and upper hybrid frequencies. Due to this process, large amplitude electrostatic waves with very narrow spectra are observed near these frequencies at any place along the auroral field lines where intense beam driven instability takes place. These intense quasi-monochromatic electrostatic waves are shown to give rise to an intense electromagnetic radiation. Depending upon the ratio omega sub pe/omega sub ce between the electron plasma frequency and the electron gyro-frequency the electromagnetic wave can be radiated in the ordinary mode (at omega sub UH), or in the extraordinary (at 2 omega sub UH). As the ratio omega sub pe/omega sub ce tends to be rather small, it is shown that the most intense radiation should be boserved at 2 omega sub UH in the extraordinary mode. Author (ESA)

N80-22575# Physics Lab. RVO-TNO, The Hague (Netherlands).
REMOTE SENSING OF THE SEA BY RADAR. ANALYSIS OF AVAILABLE DATA AND RESULTS OF NOORDWIJK, 1977
G. P. deLoor Dec. 1978 58 p refs
(PHL-1978-53; TDCK-71720) Avail: NTIS HC A04/MF A01

A survey of results from radar observations of the sea is presented. Radar measurements conducted in the Netherlands are analyzed and compared with other radar observations. Results of project Noordwijk 77 are discussed in relation to the measurements. Author (ESA)

N80-22576# Physics Lab. RVO-TNO, The Hague (Netherlands).
ON THE PERFORMANCE OF A SIMPLIFIED MTI CANCELLER SELECTION RULE FOR FUCAS
H. F. A. Roefs Mar. 1979 24 p refs
(PHL-1979-13; TDCK-71965) Avail: NTIS HC A02/MF A01

A rainclutter suppression system implemented into the experimental phased array pulse radar system FUCAS is described. The optimal selection rule (under the assumption of a Rayleigh target) is derived and, since the actual realization of this rule would be too costly, a simplified selection mechanism based solely on the clutter suppression capabilities of the cancellers is introduced and its expected performance compared with the optimal rule. Author (ESA)

N80-22577# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
DETERMINATION OF THE FAR-FIELD FROM MEASURED NEAR-FIELD DATA THEORY AND MEASURING TECHNIQUE OF THE NEAR-FIELD FAR-FIELD TRANSFORMATIONS
Arno Schrott and Volker Stein Apr. 1979 109 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-616)
(DFVLR-Mitt-79-07) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 18.30

Methods for measuring the far field of antennas at distances that are small compared to the wavelength of the field are described. Both the compact test range and the near field far field transformation methods are described. Planar, cylindrical, and spherical transformation techniques are discussed. An error analysis and examples of the methods are provided. Author (ESA)

N80-22578*# New Mexico Univ., Albuquerque. Technology Application Center.
SATELLITE TELEVISION TRANSMISSION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 1979
Gerald F. Zollars Dec. 1979 197 p Sponsored by NASA and NTIS
(NASA-CR-162933; PB80-803059) Avail: NTIS HC $30.00/MF $30.00 CSCL 17B

The bibliography cites 190 articles from the international literature. Topics include domestic satellite television systems, satellite networks, satellite transmission, space law, ground stations, satellite design, and problems of international law, and cooperation created by satellite television transmission. GRA

N80-22579*# New Mexico Univ., Albuquerque. Technology Application Center.
SATELLITE ANTENNA TECHNOLOGY. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1973 - Nov. 1979
Gerald F. Zollars Dec. 1979 55 p Sponsored by NASA and NTIS
(NASA-CR-163128; PB80-802689) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

This bibliography of citations to articles from the international literature concerns satellite antenna technology. Topics stressed are antenna design studies dealing with antenna radiation patterns and antenna arrays. This bibliography excludes articles cited in the published searches titled Communications Satellite Technology. The bibliography contains 213 citations. GRA

N80-22580# National Technical Information Service, Springfield, Va.
RANDOME TECHNOLOGY. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
William E. Reed Dec. 1979 137 p Supersedes NTIS/PS-78/1253; NTIS/PS-77/1153; NTIS/PS-76/1015 2 Vol.
(PB80-801897; NTIS/PS-78/1253; NTIS/PS-77/1153; NTIS/PS-76/1015) Avail: NTIS HC $30.00/MF $30.00 CSCL 09E

Reports from worldwide research are cited on the use of composite materials, ceramic materials, plastics, dielectrics, and protective coatings for radomes. Research on the design, construction, and fabrication is included. Performance evaluations are presented which cover wave transmission, insertion loss, effect of antenna radiation patterns, rain erosion, and impact resistance. This updated bibliography contains 134 abstracts, 30 of which are new entries to the previous edition. GRA

N80-22581# National Technical Information Service, Springfield, Va.
RADOME TECHNOLOGY, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Dec. 1976 - Nov. 1979
William E. Reed Dec. 1979 138 p Supersedes NTIS/PS-78/1252; NTIS/PS-77/1152; NTIS/PS-76/1014; NTIS/PS-75/847 2 Vol.
(PB80-801889; NTIS/PS-78/1252; NTIS/PS-77/1152; NTIS/PS-76/1014; NTIS/PS-75/847) Avail: NTIS

HC $30.00/MF $30.00 CSCL 09E

Reports from Federally-funded research are cited on the use of composite materials, ceramic materials, plastics, and protective coatings for radomes. Research on the design, construction, and manufacturing is included. Performance evaluations are presented which cover wave transmission, insertion loss, effect on antenna radiation patterns, rain erosion, and impact resistance. This updated bibliography contains 131 abstracts, 13 of which are new entries to the previous edition. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-22582 Illinois Univ. at Urbana-Champaign.
SPACE CHARGE REDUCTION IN AN EHD GENERATOR VIA FLUIDIC SWITCHING Ph.D. Thesis
Alek Chi-Heng Chen 1979 146 p
Avail: Univ. Microfilms Order No. 8009000

The effect of space charge reduction in an electrohydrodynamic (EHD) generator via fluidic switching was studied. An electrofluidic generator was shown to embody a significant advantage of space charge reduction using fluidic switching. At a certain range of frequency of fluidic switching, a substantial increase in output voltage beyond a steady flow EHD generator was obtained. A small model generator EFD-2 and a scaled up generator EFD-3 were built to study the effect of space charge reduction. Experiments were performed on EFD-2 and EFD-3 generators at various operating conditions. From experimental data and theoretical considerations, recommendations are presented for the future design of electrofluidic generators. Dissert. Abstr.

N80-22583 Pennsylvania Univ., Philadelphia.
GATE CONTROLLED DIODE FOR IONIC CONCENTRATION MEASUREMENT Ph.D. Thesis
Ching-Chang Wen 1979 222 p
Avail: Univ. Microfilms Order No. 8009477

A new type of chemically sensitive semiconductor device based on the operation of a gate controlled diode was designed and fabricated. By using the temperature gradient zone melting process to fabricate the device, both electrical and chemical shielding of the contact regions were obtained from the test solutions. The ion controlled diode (ICD) was biased into inversion by a reference electrode. The substrate-source admittance of the ICD was then measured at sufficiently high frequencies so that it was transit time limited. Theoretical analysis of blocked electrodes at equilibrium case and dynamic response were examined. Numerical methods were applied to solve the charge transport equations at different conditions for both cation and anion. It was found that the potential time response approximates an exponential behavior and the time constant is relatively insensitive to the boundary electric field. Dissert. Abstr.

N80-22584 Illinois Univ. at Urbana-Champaign.
A NEW ALGORITHM FOR THE TUNING OF ANALOG FILTERS Ph.D. Thesis
Charles John Alajajian 1979 108 p
Avail: Univ. Microfilms Order No. 8006956

An algorithm is proposed for the tuning of analog filters. Tellegen's theorem and the adjoint network concept are used to relate large changes in a set of tuning elements to desired voltage changes in the manufactured filter. The component values in the manufactured circuit are measured and the deviation of the voltages in the manufactured circuit from the corresponding voltages in the nominal circuit design are computed at a set of critical frequencies. A set of tuning resistors is chosen and this information is entered into the large change sensitivity expression. The changes in the tuning elements needed to reduce these voltages deviations to zero are computed by solving a set of linear algebraic equations whose rank is equal to the number of tuning elements plus one. It is shown that the method converges much faster to the desired solution than first order sensitivity and optimization methods. Dissert. Abstr.

N80-22585 California Univ., Los Angeles.
COMPUTER MODEL OF A CHARGE-COUPLED DEVICE FOR OPERATION IN A CIRCUIT SIMULATION PROGRAM Ph.D. Thesis
Michael Frank Caggiano 1979 188 p
Avail: Univ. Microfilms Order No. 8008464

The operation and applications of a flexible, one dimensional model of a charge coupled device programmed to operate in circuit transient analysis computer programs are described. The computer model embodies the expanded transfer inefficiency equations along with thermal generation effects and models for the CCD input and output interfaces. Although the model is comprehensive in scope, the subroutine structure, input-output functions and device parameter entries are designer oriented. The model as presently developed is expected to aid in the circuit design process employing charge-coupled devices as circuit elements. Dissert. Abstr.

N80-22586 Illinois Univ. at Urbana-Champaign.
ENCAPSULATION STUDIES AND PLANAR DEVICE FABRICATION IN GALLIUM ARSENIDE Ph.D. Thesis
Max John Helix 1979 90 p
Avail: Univ. Microfilms Order No. 8009058

Low temperature photoluminescence and Auger electron spectroscopy (AES) were used to study SiO2 and Si3N4 as encapsulants for high temperature annealing of GaAs. These encapsulants were used in the fabrication of planar diodes in GaAs, and the resulting electrical and optical properties of the devices were examined. Current-voltage characteristics for devices fabricated by Be implantation into liquid phase epitaxy and vapor phase epitaxy GaAs are compared, as well as characteristics of Zn-implanted and Zn-diffused devices. Also, preliminary studies are presented which indicate negligible lateral diffusion of Be when proper fabrication procedures are followed. Dissert. Abstr.

N80-22587 Illinois Univ. at Urbana-Champaign.
SOME MODIFICATIONS TO NEWTON'S METHOD FOR THE DETERMINATION OF THE STEADY STATE RESPONSE OF NONLINEAR CIRCUITS Ph.D. Thesis
Francis Benedict Grosz, Jr. 1979 136 p
Avail: Univ. Microfilms Order No. 8009052

Many methods have become available recently for the determination of the steady state of nonlinear circuits. The Newton method of Trick, Aprille and Colon is one of the more widely available methods. However, in certain cases, the method fails to converge to a steady state solution. Three modifications to the Newton method to increase convergence reliability or speed are proposed. The implementation of these modifications is discussed. Several example circuits are given and the results compared. Some guidelines for the use of these modified methods are also given. Dissert. Abstr.

N80-22588 Arizona State Univ., Tempe.
A STUDY OF ELECTROVISCOSITY IN A LIQUID CRYSTAL Ph.D. Thesis
John Hessler, Jr. 1979 169 p
Avail: Univ. Microfilms Order No. 8008576

A theory to explain the electroviscosity of the liquid crystal MBBA was developed. The electroviscosity theories for the other liquid crystals were shown to be nonapplicable. Inherent shear strength was shown to be a possible explanation for a published viscosity effect. The theory of producing this shear strength from an electric field was developed along with the effects on liquid crystal flow. The theory was compared with liquid crystal flow measurements. The electroviscosity in MBBA was degraded by the boundary layer effect as well as the effects of ion current. Several ways were found to reduce or eliminate these effects. The possibility of a 60 Hz three phase device was investigated. Dissert. Abstr.

N80-22589 Wisconsin Univ. - Milwaukee.
DYNAMIC BEHAVIOR OF INVERTER-FED INDUCTION MOTORS Ph.D. Thesis

Ahmed Diaa Z. M. El-Koushiry 1979 118 p
Avail: Univ. Microfilms Order No. 8009234

The dynamic behavior of the inverter fed induction motor over a wide range of speed is investigated. The inverters considered are of the forced commutation dc link type. Six-step and pulse width modulated voltage inverters are included. It is desired to find the minimal transition time for acceleration and deceleration without exceeding certain specified drive limits. Different types of loads are considered, including constant torque loads, step torque loads, inertia loads, and loads where torque is precisely related to motor speed. Most inverters use a linear frequency with time is suggested, in which a frequency-time pattern is obtained to insure speed changes to occur on the high torque, low current stable portion of the dynamic torque-speed characteristic. The least amount of inverter oversizing necessary to meet load dynamic requirements and overload conditions as well is determined. Dissert. Abstr.

N80-22590 California Univ., Los Angeles.
ELECTRICAL PROPERTIES OF SEMICONDUCTING OXIDE GLASSES BASED ON VANADIUM OXIDE Ph.D. Thesis
Chi-Hsiang Chung 1979 203 p
Avail: Univ. Microfilms Order No. 8008467

The electrical properties of binary and ternary semiconducting oxide glasses containing 55 mole % V2O5 and 45 mole % glass-forming oxides TeO2 GeO2, PbO, As2O3, BaO are discussed. Homogeneous glasses are made on all the binary systems. The condictivity of room temperature decreased in the following order; 55V2O5, 45TeO2, 55V2O5-45P2O5, 55V2O5-45AS2O3, 55V2O5-45GeO2, 55V2O5-45PbO and 55V2O5-45BaO. A theory to explain the conducting behavior of the binary glasses is developed. Dissert. Abstr.

N80-22591 American Univ., Washington, D. C.
MODIFIED PERTURBATION THEORY AND THE ELECTRICAL RESISTIVITY OF SIMPLE LIQUID METALS Ph.D. Thesis
Cornelius Patrick Brown 1979 188 p
Avail: Univ. Microfilms Order No. 8008557

The electrical resistivity of the liquid metals Li, Na, K, Be, Mg, Cd, Al and In were calculated using mass-renormalized form factors obtained from optimized model potentials and the modified perturbation theory of Shaw. It was found that renormalizing the form factors leads to marginally better agreement with experimental resistivities for the alkali metals Na and K, but has little effect on the calculated resistivities of polyvalent metals. The effect of renormalizing the prefactors in the Ziman expression for resistivity was also investigated. Dissert. Abstr.

N80-22592 Illinois Univ. at Urbana-Champaign.
ACCURACY TESTS FOR HIGH FREQUENCY ASYMPTOTIC SOLUTIONS Ph.D. Thesis
Mark Douglas Tew 1979 87 p
Avail: Univ. Microfilms Order No. 8009194

Three procedures for evaluating the accuracy of an asymptotic solution by examining its effect on satisfaction of boundary conditions are presented. Two of the procedures are suitable for assessing the accuracy of asymptotic solutions which give the surface fields of radiating or scattering bodies. Their use is illustrated by applying the procedures to proposed solutions to the problem of a magnetic dipole radiating on an infinitely long, perfectly conducting circular cylinder. The third procedure is used to evaluate the accuracy of asymptotic solutions that give the far field from a scattering or radiating body. Its use is illustrated by application to a proposed solution for the problem of scattering of an incident scalar wave by the vertex of an acoustically soft quarter-plane. In addition, two of the proposed tests can be used as an iterative equation, offering the possibility of systematic improvement of a proposed solution. Dissert. Abstr.

N80-22593 Illinois Univ. at Urbana-Champaign.
FAULT ANALYSIS OF ANALOG CIRCUITS Ph.D. Thesis
Adel Attalla Sakla 1979 135 p
Avail: Univ. Microfilms Order No. 8009157

The case is considered in which the measurement of all node voltages is possible under certain test conditions. In addition, the simulation of the adjoint circuit on the computer is required. The approach can detect large parameter variations, is highly computationally efficient, and it does not require massive storage. The formulation permits identification of necessary and sufficient test measurement errors on the approach is investigated. The approach is adapted for fault detection in circuits with accessibility to only part of the nodes. Major application is the single fault identification. It is shown that input and output voltage measurements are enough to identify single faults. The extension of the approach to the fault analysis of analog circuits with some nonlinear elements is discussed. It is shown that any number of operating points on the I-V characteristic of the faulty nonlinear elements can be determined. Dissert. Abstr.

N80-22594 Illinois Univ. at Urbana-Champaign.
THE WAVEFORM DETECTION OF PERMANENT MAGNET STEP MOTORS AND ITS APPLICATION TO CLOSED-LOOP CONTROL Ph.D. Thesis
Chin-Woei Lin 1979 308 p
Avail: Univ. Microfilms Order No. 8009090

The feasibility and the applicability of the closed-loop control of the permanent magnet (PM) step motor through waveform detection are discussed. Since the mechanical encoder generates signals which are directly related to the position and indirectly to the speed of step motor, the closed-loop control through waveform detection is essentially an observability problem. Low cost closed-loop controllers are designed based on various types of waveform detection schemes. Constant-speed control as well as the single-step deadbeat damping control are realized by these waveform-detection schemes. Sophisticated microprocessor - aided control is also accomplished in the load-adaptive/power-supply-voltage-adaptive constant-speed control by using the time-delay switching approach, which subsequently broadens the applicability of the PM step motor. Dissert. Abstr.

N80-22595 California Univ., Los Angeles.
SWITCHING BEHAVIOR OF ZINC-DOPED SILICON N-P-N STRUCTURES Ph.D. Thesis
William Edward Kingsley 1979 110 p
Avail: Univ. Microfilms Order No. 8008493

The electron initiated zinc impurity impact ionization rate was measured. Photo-current multiplication data versus bias voltage was recorded for specially fabricated P(+)-N-N(+) zinc-doped diodes. The electric field was calculated using a computer program which solved the two dimensional Poisson's equation in conjunction with the electron and hole continuity equations. Switching behavior, related to impurity ionization, was observed in zinc-compensated N(+)-N-N(+) vertical epitaxial resistors. A correlation between the experimental data and a theoretically determined result was made incorporating the measured zinc impurity ionization coefficient to provide validation of that result. Fairly good qualitative agreement with the switching behavior was obtained. Dissert. Abstr.

N80-22596*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STEADY-STATE ANALYSIS OF A FAULTED THREE-PHASE FOUR-WIRE SYSTEM SUPPLYING INDUCTION MOTORS WITH NEUTRALS CONNECTED AND OTHER SINGLE-PHASE LINE-TO-NEUTRAL LOADS
Marion E. Wood Mar. 1980 67 p refs
(NASA-TM-80795; JSC-16517; IN-EH-80-03) Avail: NTIS HC A04/MF A01 CSCL 09C

Four wire Wye connected ac power systems exhibit peculiar steady state fault characteristics when the fourth wire of three phase induction motors is connected. The loss of one phase of power source due to a series or shunt fault results in currents higher than anticipated on the remaining two phases. A theoretical approach to compute the fault currents and voltages is developed. A FORTRAN program is included in the appendix. E.D.K.

N80-22597*# Sprague Electric Co., North Adams, Mass.
STUDY OF SURGE CURRENT EFFECTS ON SOLID TANTALUM CAPACITORS Final Report
20 Mar. 1980 100 p
(Contract NAS8-33424)
(NASA-CR-161433) Avail: NTIS HC A05/MF A01 CSCL 09C

Results are presented of a 2,000 hour cycled life test program conducted to determine the effect of short term surge current

screening on approximately 47 micron f/volt solid tantalum capacitors. The format provides average values and standard deviations of the parameters, capacitance, dissipation factor, and equivalent series resistance at 120 Hz, 1KHz, abd 40 KHz.
A.R.H.

N80-22598*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED TRAVELING WAVE TUBES
Erik Buck 1980 15 p refs Presented at Western Region Electronic Warfare Tech. Meeting, White Sands Missile, Range, N. Mex., 21-24 Apr. 1980; sponsored by Assoc. of Old Crows (NASA-TM-81479; E-415) Avail: NTIS HC A02/MF A01 CSCL 09A

After a brief description of how a typical TWT works, multi-stage depressed collectors (MDC) are discussed. A quick method for computing the expected efficiency of a well engineered TWT is outlined to aid in estimating power supply needs. Applications of improved TWTs and a new power supply are suggested.
E.D.K.

N80-22599# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ADAPTIVE DISTRIBUTED-MEASUREMENT EXTENDED KALMAN FILTER FOR A SHORT RANGE TRACKER, VOLUME 1 M.S. Thesis
Robert L. Jensen and Douglas Alan Harnly Dec. 1979 173 p refs
(AD-A080249; AFIT/GA/EE/79-1-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 17/5

An adaptive extended Kalman filter algorithm is designed to track a distributed (elliptical) source target in a closed loop tracking problem, using outputs from a forward looking infrared (FLIR) sensor as measurements. The filter adaptively estimates image intensity, target size and shape, dynamic driving noise, and translational position changes due to two effects: actual target motion, and atmospheric jitter. Atmospheric backgrounds are studied for the effect of temporal and spatial correlations on filter performance. A Monte Carlo analysis is conducted to determine filter performance for two target scenarios: approximately straight approach and cross range constant velocity. Good performance is obtained for the first two trajectories. For the second trajectory, a one sigma tracking error of .2 pixel (4 microrad) has a signal to noise ratio of 12.5. The filter adapts well to changes in image intensity, size, and shape.
GRA

N80-22600# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ADAPTIVE DISTRIBUTED-MEASUREMENT EXTENDED KALMAN FILTER FOR A SHORT RANGE TRACKER, VOLUME 2 M.S. Thesis
Robert L. Jensen Dec. 1979 263 p
(AD-A080238; AFIT/GA/EE/79-1-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 17/5

Previous truth model and filter equations are presented for the adaptive Kalman filter algorithm. Real data analysis for spatial correlations of background noise and for temporal correlations of background noise is demonstrated. Calculations and computer simulation considerations are included. The FORTRAN code for the main programs, and the library of subroutines, and plot programs are presented along with input parameters.
J.M.S.

N80-22601# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Detachment.
APPLICATION OF FERROFLUIDS AS AN ACOUSTIC TRANSDUCER MATERIAL
Pieter S. Dubbelday 4 Dec. 1979 30 p refs
(RR0110842)
(AD-A079314; NRL-MR-4030; AD-E000343) Avail: NTIS HC A03/MF A01 CSCL 09/1

Application of ferrofluids to electroacoustic transduction is described. Properties of ferrofluids relevant to the problem are given, and the basic equations and derivations are developed. Power transfer calculations are performed for a piston-type transducer, and a conceptual design is offered for a toroidal configuration.
GRA

N80-22602# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PHASE RETRIEVAL USING AN IMAGING SENSOR M.S. Thesis
Charles V. Scull Dec. 1979 66 p refs
(AD-A080424; AFIT/GEO/EE/79-4) Avail: NTIS HC A04/MF A01 CSCL 09/3

This research study is concerned with spatial (relative) phase reconstruction using an imaging sensor. Specifically, work was completed which investigates the retrieval of the spatial phase of the aperture wavefront from sampled intensity data in the focal plane of an imaging sensor, where phase is not explicitly present. Techniques investigated are not interferometric methods, but are signal processing techniques that use the Fourier transform properties of a lens, analytics, and numerics to retrieve the spatial phase of the aperture field from intensity measurements in the focal plane of an imaging sensor. The techniques investigated include an analytic approach which is used to develop several numerical approaches, and the Gerchberg-Saxton Algorithm which is adapted to solve this specific phase retrieval problem. Finally, the results from simulations of these methods are compared yielding the Gerchberg-Saxton algorithm as the most promising method to approximate the relative phase in the aperture plane.
GRA

N80-22603# Westinghouse Research and Development Center, Pittsburgh, Pa.
INDIUM PHOSPHIDE FOR HIGH FREQUENCY POWER TRANSISTORS Interim Report, 21 Mar. 1978 - 21 Mar. 1979
V. L. Wrick, G. W. Eldridge, R. C. Clarke, and M. C. Driver 28 Sep. 1979 90 p refs
(Contract N00014-78-C-0254)
(AD-A080583) Avail: NTIS HC A05/MF A01 CSCL 20/12

Technology development is presented for the development of an InP power field effect transistor. Both ion implantation and vapor phase epitaxy results are presented as a means for providing an active channel. Processing technology (etching, ohmic contacts) is reviewed as well as a description of various approaches for gating n-type InP. Conclusions and plans for the last phase of the program are discussed. As a result of the first part of the program, work is to be concentrated on developing junction field effect transistor techniques.
GRA

N80-22604# Syracuse Univ., N. Y.
NONLINEAR CIRCUIT ANALYSIS PROGRAM (NCAP) DOCUMENTATION. VOLUME 1: ENGINEERING MANUAL Progress Report, May 1978 - Jul. 1979
John F. Spina (RADC, Griffiss AFB, N.Y.), Carmen A. Paludi, Jr. (RADC, Griffiss AFB, N.Y.), Donald D. Weiner, and James J. Whalen Griffiss AFB, N.Y. RADC Sep. 1979 199 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A076384; RADC-TR-79-245-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/3

The Nonlinear Circuit Analysis Program (NCAP) is a circuit analysis code which uses the Volterra approach to solve for the transfer functions and node voltages of nonlinear circuits. To increase the transportability, the code was written in ANSI FORTRAN. The code was revised and documented in a joint effort using both in-house and contracted manpower. This documentation is a result of that effort. The documentation is made up of three volumes: the Engineering Manual, the User's Manual, and the Programmer's Manual. The Engineering Manual, Volume 1, contains the introduction to the documentation, a description of the theory upon which NCAP is based, and the procedure for obtaining the input parameter data.
GRA

N80-22605# Syracuse Univ., N. Y.
NONLINEAR CIRCUIT ANALYSIS PROGRAM (NCAP) DOCUMENTATION. VOLUME 2: USER'S MANUAL Progress Report, May 1978 - Jul. 1979
Jon B. Valente (RADC, Griffiss AFB, N.Y.) and Sharon Stratakos Griffiss AFB, N.Y. RADC Sep. 1979 82 p
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A076596; RADC-TR-79-245-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/3

The Nonlinear Circuit Analysis Program (NCAP) is a circuit analysis code which uses the Volterra approach to solve for the

transfer functions and node voltages of nonlinear circuits. To increase the transportability, the code was written in ANSI FORTRAN. The code was revised and documented in a joint effort using both in-house and contracted manpower. This documentation is a result of that effort. The documentation is made up of three volumes: the Engineering Manual, the User's Manual, and the Programmer's Manual. The User's Manual, Volume 2, contains a detailed description of the NCAP input language. The description includes the input commands and data requirements. Examples are used throughout the manual to aid the user in understanding the input language. GRA

N80-22606# Syracuse Univ., N. Y.
NONLINEAR CIRCUIT ANALYSIS PROGRAM (NCAP) DOCUMENTATION. VOLUME 3: PROGRAMMER'S MANUAL Progress Report, May 1978 - Jul. 1979
Jon B. Valente (RADC, Griffiss AFB, N.Y.) and Sharon Stratakos Griffiss AFB, N.Y. RADC Sep. 1979 737 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A076317; RADC-TR-79-245-Vol-3) Avail: NTIS HC A99/MF A01 CSCL 09/3

The Nonlinear Circuit Analysis Program (NCAP) is a circuit analysis code which uses the Volterra approach to solve for the transfer functions and node voltages of nonlinear circuits. To increase the transportability, the code was written in ANSI FORTRAN. The code was revised and documented in a joint effort using both in-house and contracted manpower. This documentation is a result of that effort. The documentation is made up of three volumes: the Engineering Manual, the User's Manual, and the Programmer's Manual. GRA

N80-22607# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN OF A DIGITAL CONTROLLER FOR AN ELECTRON BEAM LITHOGRAPHY SYSTEM M.S. Thesis
Michael L. Weidner Dec. 1979 246 p refs
(AD-A080169; AFIT/GE/EE/79-41) Avail: NTIS HC A11/MF A01 CSCL 13/8

A digital controller for an electron beam lithography system was designed using microprocessor technology. Due to the high speed requirements of the system the hardware controller was implemented using a microprogram sequencer. The controller was designed as a special purpose computer. The word length of the controller computer is 40 bits. The first twenty-three bits are control bits. The other seventeen bits are used to determine which word to execute next. A Z-80A microcomputer was used in the design as an input/output device. The Z-80A outputs the pattern data. The controller uses that data and sequences the electron beam to draw the requested pattern. The controller is double buffered for increased throughput. Since both the controller and the Z-80A are programmable, the capabilities of the system can be tailored to the needs of the user. GRA

N80-22608# Brookhaven National Lab., Upton, N. Y.
LOAD EXCITATION AT THE SUPERCONDUCTING CABLE TEST FACILITY
E. B. Forsyth, A. J. McNerney, and M. Meth Sep. 1979 11 p Presented at the 7th Symp. on Superconducting Power Transmission, Moscow, Sep. 1979; sponsored by US/USSR Tech. Exchange Comm.
(Contract EY-76-C-02-0016)
(BNL-26641) Avail: NTIS HC A02/MF A01

The superconducting cable test facility was constructed to evaluate and demonstrate flexible superconducting power transmission cables under realistic conditions. Power supplies were installed to excite two superconducting cables either separately or simultaneously. The cables formed a straight run of 100 m with a pair of terminations rated for full current and voltage located at the east and west ends of the cable enclosure. The design and operation of the test facilities are discussed. DOE

N80-22609# Brookhaven National Lab., Upton, N. Y.
CALORIMETRIC MEASUREMENT OF ac LOSSES IN SUPERCONDUCTING CABLES OF SHORT LENGTHS
J. E. Jensen 1979 13 p ref Presented at the 7th Symp. on Superconducting Power Transmission, Moscow, Sep. 1979; sponsored by US/USSR Tech. Exchange Comm.
(Contract EY-76-C-02-0016)
(BNL-26712) Avail: NTIS HC A02/MF A01

The measurement of ac losses in superconducting cables by calorimetric means is necessary as a verification of electronic measurements on short high-current models and because the present method of electronic measurement is not applicable to longer cables with simultaneously applied high current and voltage. Consequently, after the first tests of Cable no. 101 showed higher losses than anticipated using the electronic wattmeter measurements, it was decided to attempt to verify these measurements calorimetrically. The results of test completed to date are reported. DOE

N80-22610# Oak Ridge National Lab., Tenn.
SATURATION AND ANISOTROPY EFFECTS OF MAGNETIZATION IN PRACTICAL COMPOSITE SUPERCONDUCTORS
S. S. Shen Oct. 1979 22 p refs
(Contract W-7405-eng-36)
(ORNL/TM-7036) Avail: NTIS HC A02/MF A01

Detailed magnetization measurements are presented, as well as an analysis on typical cryostable NbTi composite conductors (1 mm diameter and Cu/SC ratio of 6:5) with filaments nonuniformly distributed in both circular and rectangular cross sections. As a result of the excellent agreement between the measurements and a previously reported transformer model, both transient magnetization and losses incurred in each sample can be described by functions of a unique time constant tau sub o, which depends strongly on the shape of the cross section. Other prominent features of the measurement results, such as the deduction of values of J/sub c/ and matrix resistivity, are demonstrated. DOE

N80-22611# California Inst. of Tech., Pasadena. Lab. of Engineering Materials.
SUPERCONDUCTING PROPERTIES OF RAPIDLY QUENCHED AND HEAT TREATED Zr-V AND Hf-V FOILS
M. Tenhover Sep. 1979 18 p refs
(Contract EY-76-C-03-0822)
(CALT-822-111) Avail: NTIS HC A02/MF A01

The results of rapid quenching and subsequent heat treatments on the superconducting properties of the Zr-V and Hf-V binary systems are presented. Metallic glasses can be prepared in these systems which have very attractive properties for practical application. The existence of a flexible glassy phase raises the prospect of alternative methods for the construction of superconducting devices. The As-quenched, partially crystalline material is characterized by small critical currents, yet relatively large upper critical fields and transition temperatures. Heat treatments considerably enhance the current carrying capability. DOE

N80-22612# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
INTERACTION OF SUPERCONDUCTING VORTICES: LECTURES PRESENTED AT THE CANADIAN MATHEMATICAL SOCIETY SUMMER RESEARCH INSTITUTE ON GAUGE THEORIES
Claudio Rebbi Sep. 1979 19 p refs Lectures held at Montreal, Sep. 1979
(Contract EY-76-C-02-0016)
(BNL-26736) Avail: NTIS HC A02/MF A01

Results recently obtained on multivortex configurations are described. After a brief review of the model, a numerical analysis, performed by variational methods, of the interaction between two vortices is illustrated. The study, shows that two vortices attract or repel each other according to whether a dimensionless coupling constant lambda, characterizing the relative strength of the matter self-coupling versus the gauge coupling, takes a value smaller or greater than one. This agrees with results previously obtained for asymptotic separations of the vortices. For lambda = 1, in particular, the vortices appear in equilibrium at any separation, hinting to the existence of a much wider class of solutions to the field equations. The case lambda = 1 is considered in detail, illustrating analytical results which demonstrate that for this special value of the coupling constant solutions with any number of vortices at arbitrary positions do indeed exist. DOE

N80-22613# Oak Ridge National Lab., Tenn.
EDDY CURRENT HEATING OF IRREGULARLY SHAPED PLATES BY SLOW RAMPED FIELDS
Lawrence Dresner Sep. 1979 49 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6968) Avail: NTIS HC A03/MF A01

Eddy current heating of thin conducting plates of various shapes by a perpendicular field is studied, assuming that the magnetic field created by the eddy currents is negligible in comparison with the external field. The method introduces the stream function of the eddy currents, which is shown to satisfy Poisson's equation, and then employs a pair of complementary variational principles, the extrema of which equal the eddy current heating. Two such complementary principles give not only an estimate of the eddy current heating, but a bound on the error of the estimate as well. DOE

N80-22614# Sandia Labs., Albuquerque, N. Mex.
HIGH-TEMPERATURE ELECTRONICS: AN OVERVIEW
Richard C. Heckman 1979 8 p refs
(Contract EY-76-C-04-0789)
(SAND-79-2319A) Avail: NTIS HC A02/MF A01

The state of the art in high temperature electronics is briefly described and the major areas where developments are needed are identified. The geothermal program, high temperature oil and gas well logging, jet engine monitors, and circuits for operation in the sodium coolant loop of a breeder reactor have simulated research. DOE

N80-22615# Los Alamos Scientific Lab., N. Mex.
MICROPROCESSOR-BASED STEPPING MOTOR DRIVER
J. K. Halbig and S. F. Klosterbuer Sep. 1979 26 p refs
(Contract W-7405-eng-36)
(LA-7895) Avail: NTIS HC A03/MF A01

A versatile stepping motor driver to do beam diagnostic measurements is described. The driver is controlled by a microprocessor and can move eight stepping motors simultaneously. The driver can monitor and respond to clockwise and counterclockwise-limit switches, and it can monitor a 0 to 10 V dc position signal. The software controls start and stop vamping and maximum stepping rates. DOE

N80-22616# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
CADMIUM SULFIDES/COPPER SULFIDE HETEROJUNCTION CELL RESEARCH Technical Progress Report, 1 Jun. - 31 Aug. 1979
W. W. Anderson and A. D. Jonath Oct. 1979 38 p refs
(Contract EG-77-C-01-4042)
(SER-9033-1/2; LMSC-D-82842) Avail: NTIS HC A03/MF A01

Off stoichiometric resistivity control of Cds was achieved by cyclic sputtering of a Cd cathode in H2S/Ar and pure Ar. Resistivities of 1000 to 10,000 omega/cm were achieved. An effect of substrate metallization upon CdS deposition rate was identified as a temperature effect. The substrate metallization was found to change the radiative heat balance of the substrate glass. Differential thermal analysis measurements indicate that reactively sputtered Cu/sub x/S has the same phase change properties as single crystal Cu/sub x/S with x in the range 1.994 or equal to 1.997. DOE

N80-22617# Minnesota Univ., Minneapolis.
CONTRIBUTION OF ELECTRONICALLY EXCITED STATES TO THE RADIATION CHEMISTRY OF ORGANIC SYSTEMS Progress Report, 1 Sep. 1978 - 31 Aug. 1979
S. Lipsky 1979 15 p refs
(Contract EY-76-S-02-0913)
(COO-913-70) Avail: NTIS HC A02/MF A01

The effect of n-perfluorohexane to quench both the emission and photoionization current of N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD) in isooctane and in tetramethylsilane was investigated and shown to be consistent with an interaction of perfluorohexane with some relatively long-lived, coherently excited state of TMPD that is generated at the photoionization threshold and which decays either to the emitting state of TMPD or to a geminate ion pair. The 0 degrees and 90 degrees electron impact spectra of the stable isomers of C3, C4, and C5 saturated hydrocarbons were determined. Preliminary results show large structural effects on the lowest Rydberg singlet-triplet splittings. Two photon excited emission spectra of decalin, bicyclohexyl, and cyclohexane were observed in good agreement with previously reported one photon spectra. A weak emission from propylene was also detected. Other significient results are reported. DOE

N80-22618# Westinghouse Electric Corp., Pittsburgh, Pa.
DESIGN OF A 20-MJ SUPERCONDUCTING OHMIC-HEATING COIL
S. K. Singh, J. H. Murphy, M. A. Janocko, H. E. Haller, D. C. Litz, P. W. Eckels, J. D. Rogers, and P. Thullen 1979 7 p refs Presented at the 8th IEEE Symp. on Eng. Probl. of Fusion Res., San Francisco, 13 Nov. 1979 Prepared in cooperation with LASL
(Contract W-7405-eng-36)
(LA-UR-79-3260; CONF-791102-52) Avail: NTIS HC A02/MF A01

Conceptual designs of 20-MJ superconducting coils which were developed to demonstrate the feasibility of an ohmic-heating system were discussed. The superconductor materials were NbTi and Nb3Sn for the pool boil and forced-flow cooling, respectively. The coils were designed to be cryostable for bipolar operation from +7 to -7 tesla maximum field within one second. The structural design addresses the distribution of structure and structural materials used in the pulsed field environment. The cyclic stresses anticipated and the fatigue limits of the structural materials were examined in view of the operating life of the coil. The coils were designed to generate the flux swings while simultaneously meeting the limitations imposed by cooling, insulation, current density and the stresses in the materials. Both the pool and forced cooled conductors have the same criterion for cryostability, i.e., the conductor must return to the superconducting state from an initial temperature of 20 K while the full transport current is flowing through the conductor. DOE

N80-22619# Los Alamos Scientific Lab., N. Mex.
COMMUTATOR dc MACHINES USED AS MECHANICAL CAPACITORS IN A SERIES RESONANT OHMIC-HEATING CIRCUIT SIMULATION
Philip Thullen and D. M. Weldon 1979 6 p refs Presented at the 8th IEEE Symp. on Eng. Probl. of Fusion Res., San Francisco, 13-16 Nov. 1979
(Contract W-7405-eng-36)
(LA-UR-79-3122; CONF-791102-40) Avail: NTIS HC A02/MF A01

From 8th symposium on engineering problems of fusion research; San Francisco, CA, USA (13 Nov. 1979). Rotating electrical machines, and in particular commutator dc machines can serve as a high-power energy-source for testing large, pulsed magnets. A pulsed power supply based on traction motors is described which will be used to test the LASL prototype 20-MJ superconducting Tokamak induction coil. DOE

N80-22620# Los Alamos Scientific Lab., N. Mex.
AXIAL CURRENTS, SUPERCURRENTS AND ANOMALIES IN SUPERSYMMETRIC QED
Thomas E. Clark 1979 9 p refs Presented at the Supergravity Workshop, Stony Brook, N.Y., 26 Sep. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2829; CONF-790989-1) Avail: NTIS HC A02/MF A01

The currents associated with the superconformal symmetries are defined as moments of the supercurrent, V/sub mu. All of the current (non-) conservation equations are known once the generalized trace of the supercurrent, D/sup alpha/V/sub alpha alpha/, is found. The superformal anomalies are shown to have coefficients given by beta of the Callan-Symanzik equation. In super QED there is an additional U(1) axial current whose anomaly has a coefficient with no radiative corrections. DOE

N80-22621# Siemens A.G., Munich (West Germany). Unternehmensbereicht Bauelemente.
ELECTRON BEAM WRITING ON SEMICONDUCTORS Final Report
Hartwig Bierhenke, Egmont Kutzer, Pascher Adolf, Hans Plitzner, and Peter Rummel Bonn Bundesmin. fuer Forsch. u. Technol.

Aug. 1979 134 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-14) Avail: NTIS HC A07/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 27,70

The results of a 3 year research project related to the production of integrated circuits are reported. Included are wafer exposure techniques, mask making, resist techniques, studies of alignment procedures, manufacturing of device samples, and radiation damage. The use of a commercially acquired electron beam machine in making microelectronic circuits is described.
Author (ESA)

N80-22622# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).
A METHOD OF MEASURING THE TOTAL dc ELECTRIC FIELD IN THE VICINITY OF A SPACECRAFT USING ARTIFICIALLY INJECTED CHARGED PARTICLES
M. Pirre, M. Hamelin, T. R. Sanderson (ESTEC, Noordwijk, Netherlands), and G. L. Webb (ESTEC, Noordwijk, Netherlands) Apr. 1979 42 p refs Submitted for publication
(CRPE-NT-68) Avail: NTIS HC A03/MF A01

A method of measuring both the perpendicular and parallel dc electric field in the vicinity of a spacecraft using artificially injected charged particles is presented. The method uses a rendezvous between the spacecraft and injected particles after a number of complete gyrations around the magnetic field plus one partial gyration in order to measure the field and potential structure at short distances from the spacecraft. The characteristics of the measurements are evaluated with emphasis on the echo delay time of the particles and the sensitivity. The requirements for guns and detectors are assessed including their orientation, the beam intensity, and the detector time resolution and sensitivity.
Author (ESA)

N80-22623# Siemens A.G., Munich (West Germany). Unternehmensbereicht Bauelemente.
PLANAR TRANSISTORS AND IMPATT DIODES WITH ION IMPLANTATION Final Report
Heinz Dorendorf, Hans Glawischnig, Leo Grasser, and Juergen Hammerschmitt Bonn Bundesmin. fuer Forsch. u. Technol. Nov. 1979 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-16) Avail: NTIS HC A04/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 12,20

Low frequency planar n-p-n and p-n-p transistors were developed using ion implantation of boron and phosphorus by a drive-in diffusion. The electrical parameters of the transistors are comparable with conventionally produced transistors. The noise figure was improved and production tolerances were reduced. Silicon avalanche diodes for the microwave range were fabricated with implanted p-n junctions and tested for their high frequency characteristics. These diodes, made in an improved upside down technique, delivered output power of up to 40 mW at 30 GHz. Reverse leakage current and current carrying capacity were comparable to diffused structures.
Author (ESA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-22624 Illinois Univ. at Urbana-Champaign.
IDENTIFICATION OF THE DOMINANT FLOW STRUCTURE IN THE VISCOUS WALL REGION OF A TURBULENT FLOW Ph.D. Thesis
Johannes Hubertus Antonius Hogenes 1979 190 p
Avail: Univ. Microfilms Order No. 8009061

The coherent eddy structure and the bursting phenomenon were explored in the viscous wall region of a fully developed turbulent pipe flow. Multiple wall probes were used to measure the velocity gradients in the axial and spanwise directions at the wall. Also multiple probes were used in the fluid downstream from the wall probes to measure the axial velocities at different radial positions. The dominant flow structure in the viscous wall region was found to be a simultaneous flow of high axial momentum fluid towards the wall and low axial momentum away from the wall. The nature of turbulence implies that inflows and outflows are distributed randomly in space and time, inducing inflow-outflow sequences (and vice versa). The common feature of these sequences is a rapid acceleration of the axial velocity fluctuations leading to inflexional velocity profiles.
Dissert. Abstr.

N80-22625 Minnesota Univ., Minneapolis.
NATURAL CONVECTION FROM OPENED- AND CLOSED-SIDED VERTICAL PARALLEL PLATES FROM FIN-TUBE CONFIGURATIONS Ph.D. Thesis
Parviz Ahmadi Bahrami 1979 101 p
Avail: Univ. Microfilms Order No. 8006578

Experiments were performed to study the heat (mass) transfer characteristics for natural convection at the face-to-face surfaces of the parallel, square vertical plates. The experiments encompassed conditions where all the sides of the system were open to the ambient as well as conditions where one or both of the sides were closed. In addition, by the insertion of a horizontal tube between the plates the experiments were extended to a natural convection fin and tube heat exchanger. The fin and tube heat exchanger configuration experiments showed that the heat transfer rates are independent of the exposed surface area of the plate and that the transfer occurs exclusively at the peripheral regions of the plate surfaces. These findings strongly suggest that, contrary to common belief, the transfer rates are proportional to the perimeter of the plate rather than to its surface area.
Dissert. Abstr.

N80-22626 Princeton Univ., N. J.
STABILITY OF VISCOSITY STRATIFIED FLOW BETWEEN ROTATING COAXIAL CYLINDERS Ph.D. Thesis
Wing-Tsan Wong 1980 181 p
Avail: Univ. Microfilms Order No. 8008952

The flow of two concentric Newtonian liquid layers between rotating coaxial cylinders was chosen as a ideal model to study, by means of the principles of the linear theory of hydrodynamic stability, the fundamental nature of viscous liquid mixing. Interfacial instability due to infinitesimal wavy disturbances was examined using regular perturbation methods in the asymptotic limits of small and large wave numbers for axisymmetric modes. In the long wave regime(small wave number), instability was caused by inertial centrifugal force and the possibility of instability was greatly enhanced by the presence of viscosity stratification.
Dissert. Abstr.

N80-22627 Illinois Univ. at Urbana-Champaign.
CORRELATION AND SPECTRAL MEASUREMENTS OF FLUCTUATING PRESSURES AND VELOCITIES IN ANNULAR TURBULENT FLOW Ph.D. Thesis
Randall Joe Wilson 1979 162 p
Avail: Univ. Microfilms Order No. 8009210

The fluctuating velocity field, the fluctuating static wall pressure, and the in stream fluctuating static pressure in an annular turbulent air flow system with a radius ratio of 4.314 were investigated. Direct measurements of the mean velocity profile, turbulent velocity field, fluctuating static wall pressure and in stream fluctuating static pressure were taken. The statistical values of the turbulent intensity levels, power spectral densities of the turbulent quantities, the cross correlation between the fluctuating static wall pressure and the fluctuating static pressure in the core region of the flow and the cross correlation between the fluctuating static wall pressure and the fluctuating velocity field in the core region of the flow were obtained. The velocity measurements were made with X-probe hot wire sensors utilizing standard constant temperature hot wire anemometry techniques.
Dissert. Abstr.

N80-22628 Illinois Univ. at Urbana-Champaign.
INERTIAL EFFECTS IN DROPLET MOTION Ph.D. Thesis
Michael Bruce Stewart 1979 45 p
Avail: Univ. Microfilms Order No. 8009182

The effects of local or convective acceleration for three separate examples of axisymmetric viscous flows about spherical or nearly spherical objects were investigaged. The first example extends a steady, zero Reynolds number solution of flow around dielectric drop suspended in a second fluid on which a uniform electric field is superimposed. In the second example, the transient response of a droplet with variable internal mass and density is derived for two different forcing functions when the convective acceleration is negligible. The stream functions, retarding fluid forces and resulting droplet velocities are presented. The final example examines both the local and convective acceleration effects on a droplet translating through a viscous fluid with a velocity having a small fluctuating component. Dissert. Abstr.

N80-22629 California Univ., Los Angeles.
AN EXPERIMENTAL STUDY OF CONVECTION IN A ROTATING LAYER Ph.D. Thesis
Kenneth Eugene Heikes 1979 97 p
Avail: Univ. Microfilms Order No. 8008483

The results of an experimental study of convection in a thin horizontal layer of fluid rotating about a vertical axis are presented. Three Prandtl numbers were used and certain ranges of Taylor and Rayleigh numbers were covered. Emphasis was placed on the Kuppers-Lortz instability because of its relationship to fully developed turbulence. Dissert. Abstr.

N80-22630 Michigan Univ., Ann Arbor.
EXPERIMENTAL STUDY OF CYLINDRICAL TWO PHASE DETONATIONS IN MONODISPERSE SPRAYS Ph.D. Thesis
Ram Bar-Or 1979 281 p
Avail: Univ. Microfilms Order No. 8007705

A specially designed detonation chamber was used to model cylindrical clouds of fuel sprays. Propagation velocities of cylindrical blast waves in all gaseous atmospheres and in corroactive sprays were determined experimentally. The results indicated that blast waves attenuate faster propagating in sprays than in gas only and that the rate of attenuation depends on the mass loading of the liquid in the gas. The structure and propagation characteristics of detonation waves are sprays were observed, measured, and evaluated for volatile and non-volatile fuels. It was demonstrated that the detonation of non-volatile sprays is characterized by a long reaction zone and that the controlling mechanism in the reaction zone is the aerodynamic shattering of the liquid droplets. Explosive ignition was always observed in the wakes behind the shattered droplets of nonvolatile fuels in oxygen (or oxygen-rich atmospheres). Dissert. Abstr.

N80-22631 Rutgers - The State Univ., New Brunswick, N. J.
NATURAL CONVECTION IN RECTANGULAR AIR ENCLOSURES OF ASPECT RATIO LESS THAN ONE Ph.D. Thesis
Evi In Lee 1979 248 p
Avail: Univ. Microfilms Order No. 8008900

Natural convection heat transfer in rectangular air enclosures of aspect ratio between 0.1 and 1.0 for the Grashof number range of 1,000,000 to 30,000,000 was investigated both experimentally and numerically. Steady two dimensional laminar natural convection in these enclosures was analyzed using finite difference techniques. The heat transfer rates across the enclusures were measured interferometrically for the isothermal enclosure and the foam enclosure. Horizontal and vertical velocities within the enclosures were measured with a laser Doppler anemometer. The flow patterns within the enclosures were visualized by backlighting the enclosure with laser light and injecting cigarette smoke into the enclosure. Dissert. Abstr.

N80-22632*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HEATING RATE MEASUREMENTS OVER 30 DEG AND 40 DEG (HALF ANGLE) BLUNT CONES IN AIR AND HELIUM IN THE LANGLEY EXPANSION TUBE FACILITY
N. M. Reddy Mar. 1980 58 p refs
(NASA-TM-80207) Avail: NTIS HC A04/MF A01 CSCL 20D

Convective heat transfer measurements, made on the conical portion of spherically blunted cones (30 deg and 40 deg half angle) in an expansion tube are discussed. The test gases used were helium and air; flow velocities were about 6.8 km/sec for helium and about 5.1 km/sec for air. The measured heating rates are compared with calculated results using a viscous shock layer computer code. For air, various techniques to determine flow velocity yielded identical results, but for helium, the flow velocity varied by as much as eight percent depending on which technique was used. The measured heating rates are in satisfactory agreement with calculation for helium, assuming the lower flow velocity, the measurements are significantly greater than theory and the discrepancy increased with increasing distance along the cone. M.G.

N80-22633*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATUS OF LINEAR BOUNDARY-LAYER STABILITY AND THE e TO THE nTH METHOD, WITH EMPHASIS ON SWEPT-WING APPLICATIONS
Jerry N. Hefner and Dennis M. Bushnell Apr. 1980 50 p refs
(NASA-TP-1645; L-13313) Avail: NTIS HC A03/MF A01 CSCL 20D

The state-of-the-art for the application of linear stability theory and the e to the nth power method for transition prediction and laminar flow control design are summarized, with analyses of previously published low disturbance, swept wing data presented. For any set of transition data with similar stream distrubance levels and spectra, the e to the nth power method for estimating the beginning of transition works reasonably well; however, the value of n can vary significantly, depending upon variations in disturbance field or receptivity. Where disturbance levels are high, the values of n are appreciably below the usual average value of 9 to 10 obtained for relatively low disturbance levels. It is recommended that the design of laminar flow control systems be based on conservative estimates of n and that, in considering the values of n obtained from different analytical approaches or investigations, the designer explore the various assumptions which entered into the analyses. E.D.K.

N80-22634*# California Univ., Los Angeles.
CRYOGENIC-COOLANT He4-SUPERCONDUCTOR DYNAMIC AND STATIC INTERACTIONS
S. Caspi, C. Chuang, Y. I. Kim, R. J. Allen, and T. H. E. Frederking Apr. 1980 90 p refs
(Grant NsG-3153)
(NASA-CR-3262; UCLA-ENG-7867) Avail: NTIS HC A05/MF A01 CSCL 20D

A composite superconducting material (NbTi-Cu) was evaluated with emphasis on post quench solid cooling interaction regimes. The quasi-steady runs confirm the existence of a thermodynamic limiting thickness for insulating coatings. Two distinctly different post quench regimes of coated composites are shown to relate to the limiting thickness. Only one regime, from quench onset to the peak value, revealed favorable coolant states, in particular in He2. Transient recovery shows favorable recovery times from this post quench regime (not drastically different from bare conductors) for both single coated specimens and a coated conductor bundle. E.D.K.

N80-22635*# B & K Engineering, Inc., Towson, Md.
LONG TERM TESTS OF THE HEPP LIQUID TRAP DIODE HEAT PIPE PROTOTYPE Final Report
Apr. 1980 11 p refs
(Contract NAS2-10203)
(NASA-CR-152358; BKO67-1004) Avail: NTIS HC A02/MF A01 CSCL 20D

The test results which were obtained with the HEPP liquid trap diode heat pipe prototype after it had been in storage for almost 27 months are presented. Transport data were obtained over the range of 150 to 220 K and reverso mode shutdown was measured with nominal operation at 180 K. J.M.S.

N80-22636# Naval Ship Research and Development Center, Bethesda, Md. Ship Acoustics Dept.
INFLUENCE OF FLUID LOADING ON THE TRANSMISSION ACROSS, RADIATION FROM, AND REFLECTION BY RIBS ON A PANEL Final Report
D. Crighton, T. Eisler, and G. Maidanik Jan. 1980 43 p
(AD-A080396; DTNSRDC/SAD/258E-1902) Avail: NTIS

HC A03/MF A01 CSCL 20/1

A formalism of the response of an infinite, plane, and uniform panel is derived in terms of the impulse response function. The modification of the impulse response function caused by attaching parallel line mechanical constraints is considered. It is shown that the impulse response function of the so constrained panel can be cast in the form of two terms. The first is simply the impulse response of the unconstrained panel. The second is a functional of the impulse response function of the unconstrained panel and the impedances of the line mechanical constraints. It is argued that the formalism so cast is particularly suitable for ascertaining the modification to the response introduced by line mechanical constraints (ribs). The argument is exemplified by deriving the expressions for the transmission coefficient across the ribs, the radiation to the far field generated by the presence of the ribs, and the change in the reflective properties of the panel introduced by the ribs. GRA

N80-22637# Martin Marietta Labs., Baltimore, Md.
UNSTEADY LAMINAR FLOW Final Report, Oct. 1977 - Jan. 1980
K. C. Wang Jan. 1980 13 p refs
(Contract N00014-77-C-0650)
(AD-A080192) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report was aimed at developing the methodology for computing unsteady laminar boundary layers with flow reversal and establishing a new unsteady separation criterion. The calculation of two dimensional, unsteady boundary layers based strictly on the analogy with the steady, three dimensional problems has been completed. The results demonstrated the validity of the proposed unsteady separation criterion. As a prelude to understanding the full, three dimensional, unsteady problem, this report also treated an unsteady symmetry-plane boundary layer. Initial test calculations were successful, but the bulk of the computation remains to be carried out. GRA

N80-22638# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE VALIDITY OF VELOCITY CALCULATIONS BASED ON THE PLUG FLOW ASSUMPTION IN FLOW TUBE APPLICATIONS M.S. Thesis
Paul J. Wolf Dec. 1979 99 p refs
(AD-A080179; AFIT/GEP/PH/79D-14) Avail: NTIS HC A05/MF A01 CSCL 07/4

The validity of linear velocity calculations based on the plug flow assumption were tested on flowing argon at 4.2, 5.0, 6.0, and 10.1 torr. The linear velocity of argon was experimentally determined along the centerline of a flow tube, using the argon afterglow technique. It was found that the linear velocity was 1.62 times the plug flow (average) velocity at a flow rate of 4576.0 standard cc/min and 1.77 times the plug flow velocity at 5262.4 standard cc/min. The velocity data taken at various distances from the centerline revealed a fully developed laminar flow. The velocity results differed from that predicted by the Poiseuille flow formula, and it was determined that this difference was mainly due to obstructions in the argon flow. It was concluded that the plug flow assumption can be used to obtain linear gas velocities in a fully developed laminar flow and approximate gas velocities if the laminar flow is not fully developed. A Stern-Volmer plot was constructed and the results indicated that the 1D - 1S multiplet of Ar V was responsible for the afterglow. GRA

N80-22639# Defence Research Establishment Atlantic, Dartmouth (Nova Scotia). Research and Development Branch.
WATER TUNNEL TESTS ON A NACA 16-309 SECTION EQUIPPED WITH A SIMPLE, SEALED FLAP
Eric A. Jones and Michael Mackay Dec. 1979 64 p refs
(AD-A080617; DREA-TM-79/C) Avail: NTIS HC A04/MF A01 CSCL 20/4

Water tunnel tests are described of a NACA 16-309 section equipped with a 25% flap-chord ratio, simple, sealed flap. Lift and pitching moment coefficients are given for a range of angles of attack, flap angles and cavitation numbers. Drag data are not considered reliable and only a few values are presented. The results are also given of limited tests for the dependency of force, moment and cavitation inception data on Reynolds number over the range from 1,250,000 to 3,980,000. GRA

N80-22640# Physical Sciences, Inc., Woburn, Mass.
REMOTE MEASUREMENT OF DENSITY FLUCTUATIONS IN TURBULENT FLOWS Final Report, 1 Aug. 1978 - 31 Jul. 1979
J. S. Goela, T. F. Morse (Brown Univ.), and L. G. Piper 1 Aug. 1979 75 p refs
(Contract F49620-78-C-0099; AF Proj. 2307)
(AD-A080108; PSI-TR-189; AFOSR-80-0027TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the results of a theoretical study carried out to explore the possibility of obtaining quantitative information about density fluctuations in an air turbulent flow. Specific techniques considered for analysis include a new three-level gain measurment technique, the use of laser induced gas breakdown as a diagnostic tool, and monitoring of the laser induced fluorescence signal. The effect of turbulence on the diagnostic design is considered and the possibility of conducting a laboratory experiment with the use of commercially available lasers is discussed. GRA

N80-22641# Dayton Univ., Ohio. School of Engineering.
ANALYSIS OF SOLIDIFICATION IN A CYLINDRICAL ANNULUS WITH INTERNAL FINS Final Report, Oct. 1977 - Oct. 1978
Howard E. Bandow and John N. Crip Wright-Patterson AFB, Ohio AFAPL Jul. 1979 83 p refs
(Contract F33615-77-C-2004; AF Proj. 3145)
(AD-A080131; UDR-TR-78-69; UDSE-TR-78-07; AFAPL-TR-79-2088) Avail: NTIS HC A05/MF A01 CSCL 10/3

Solutions are presented for the one dimensional and two dimensional inward solidification of a material contained in a cylindrical annulus. The outer boundary is insulated and the inner boundary is subject to a constant efflux via a heat pipe. Results are presented for the axisymmetric case and for the cases of three and six longitudinal fins of rectangular cross section. The fins extend radially from inner to outer radius and were symmetrically spaced in the circumferential direction. The phase change material was LiF-MgF2-KF and was assumed to be initially at the fusion temperature. GRA

N80-22642# New York Univ., N. Y. Dept. of Applied Science.
A TWO DIMENSIONAL COMPRESSIBLE, NONLINEAR STABILITY ANALYSIS WITH APPLICATIONS TO THE STUDY OF BOUNDARY LAYER TRANSITION Final Report, 15 Sep. 1977 - 15 May 1978
Gabriel Miller and Andrew Callegari Oct. 1979 30 p refs
(Contract N00014-76-C-0183; NR Proj. 061-232)
(AD-A080987; NYU/DAS-79/16) Avail: NTIS HC A03/MF A01 CSCL 20/4

A computer program which can investigate the nonlinear response of a compressible boundary layer on a flat plate to any imposed external disturbance has been produced. The program first computes the boundary condition near the leading edge utilizing linear stability theory and then determines the disturbance field downstream as a function of time, utilizing the MacCormack time splitting explicit technique. The program originally created to provide a fundamental understanding of boundary layer response to acoustical disturbances has been modified so that a wide range of parameters can be varied. The effects of Mach number and wall conditions can be computed utilizing the program. GRA

N80-22643# Naval Postgraduate School, Monterey, Calif.
A GENERAL PROCEDURE FOR OBTAINING VELOCITY FROM A SYSTEM OF HIGH RESPONSE IMPACT PRESSURE PROBES Technical Progress Report, Jul. 1978 - Jul. 1979
D. Adler and R. P. Shreeve Jul. 1979 90 p refs
(AD-A080798; NPS67-79-007) Avail: NTIS HC A05/MF A01 CSCL 20/4

A technique to measure a high frequency, repetitively pulsating flow field is presented. Two impact tube probes and a Kiel probe, all with pressure transducers mounted in their tips are used. Five readings are required to identify a velocity vector at a point. In this report the technique, the numerical procedure and the computer program used are described. GRA

N80-22644# Iowa Inst. of Hydraulic Research, Iowa City.
EXPERIMENTS ON TRANSITIONAL OSCILLATORY PIPE FLOW
B. R. Ramaprian and S. W. Tu Aug. 1979 128 p refs
(Grant DAAG29-79-G-0017)
(AD-A081180; IIHR-221) Avail: NTIS HC A07/MF A01 CSCL 20/4

Fully developed oil flow in a smooth circular pipe at a mean Reynolds number of about 2100 was subjected to a nominally sinusoidal flow modulation at frequencies ranging from 0.05 - 1.75 Hz. It was observed that flow oscillation increased the critical Reynolds number and, under certain conditions, even brought about laminarization of the flow, which would be intermittently turbulent at the mean Reynolds number under quasi-steady (infinitely small oscillation frequency) conditions. The occurrence and extent of laminarization was, however, found to depend on factors such as the intermittancy of turbulent puffs in the mean quasi-steady flow, frequency of oscillation, etc. Two series of experiments were performed. In one series, the oscillatory flow was almost completely laminarized. In the other series, the oscillatory flow was fully turbulent. In both the cases, instantaneous velocities in the flow were measured using Laser Doppler anemometry. The instantaneous velocity was decomposed into time-mean, periodic and random components employing ensemble averaging techniques. The experiments indicated that the laminarized oscillatory flow behaves very similar to laminar oscillatory flow at either end of the Strouhal number range studied. The oscillatory turbulent flow was found to depend on both the Strouhal number and the ratio of the oscillation frequency to some characteristic frequency of turbulence in the flow. GRA

N80-22645# Illinois Univ. at Urbana-Champaign. Dept. of Chemical Engineering.
IDENTIFICATION OF THE DOMINANT FLOW STRUCTURE IN THE VISCOUS WALL REGION OF TURBULENT FLOW
Johannes H. A. Hogenes and Thomas J. Hanratty Aug. 1979 194 p
(Contract N00014-76-C-1034)
(AD-A080853; TR-2) Avail: NTIS HC A09/MF A01 CSCL 20/4

The coherent eddy structure and the bursting phenomenon were explored in the viscous wall region of a fully developed turbulent pipe flow. Multiple wall probes were used to measure the velocity gradients in the axial and spanwise directions at the wall. Also multiple probes were used in the fluid downstream from the wall probes to measure the axial velocities at different radial positions. The measurements were performed in a vertical flow system with an internal diameter of 20 cm and a Reynolds number of approximately 30,000. The dominant flow structure in the viscous wall region was found to be a simultaneous flow of high axial momentum fluid towards the wall and low axial momentum away from the wall. The nature of turbulence implies that inflows and outflows are distributed randomly in space and time, inducing inflow-outflow sequences (and vice versa). The common feature of these sequences is a rapid acceleration of the axial velocity fluctuations leading to inflexional velocity profiles. Profile inflexions are a flow phenomenon; they are a consequence of the outflow-inflow sequence. GRA

N80-22646# ARO, Inc., Arnold Air Force Station, Tenn.
A METHOD FOR ESTIMATING JET ENTRAINMENT EFFECTS ON NOZZLE-AFTERBODY DRAG Final Report, Oct. 1978 - Sep. 1978
R. C. Bauer AEDC Feb. 1980 27 p refs
(AD-A080955; AEDC-TR-79-85) Avail: NTIS HC A03/MF A01 CSCL 20/4

A highly simplified analysis was used to derive an expression for estimating the induced afterbody drag caused by the turbulent jet-mixing process. The approach estimates the induced velocity produced by the jet-mixing process and uses small perturbation concepts to estimate the resulting pressure change on the afterbody surface from which the induced afterbody drag coefficient is obtained. The theoretical induced afterbody drag (entrainment drag) is combined with the maximum jet plume diameter blockage condition to form a correlation method that accounts for the effect of jet area ratio, exit angle, total temperature, molecular weight and ratio of specific heats for a given external stream Mach number, Reynolds number, and afterbody geometry. For verification, the correlation method was used to predict the drag of an H2 and C2H4 jet from the measured drag of an N2 jet and to predict the drag of a hot jet from the measured drag of a cold jet for both the 15- and 25-deg AGARD afterbody configurations in the Mach number range from 0.6 to 1.5. The average accuracy of the correlation method is better than 10% for both afterbody configurations and is 40 to 50 % more accurate than a correlation method based only on the blockage parameter. A brief numerical study indicates that the major parameter which correlates the jet entrainment effect is the product of the jet gas constant and total temperature. GRA

N80-22647# ARO, Inc., Arnold Air Force Station, Tenn.
GUMRAP: A COMPUTER PROGRAM FOR ANALYZING MOLECULAR FLOW IN COMPLEX ENCLOSURES Final Report, 1 Oct. 1978 - 24 Sep. 1979
Max Kinslow AEDC Feb. 1980 45 p
(AD-A080917; AEDC-TR-79-76) Avail: NTIS HC A03/MF A01 CSCL 20/4

The General Unwanted Energy Rejection Analysis Program (GUERAP), which uses a Monte Carlo ray trace technique to analyze complex optical systems, has been in use for a number of years. This report describes the development of a molecular ray trace computer code (GUMRAP) based upon the extensive geometric and Monte Carlo ray trace portion of GUERAP. Portions of GUERAP strictly concerned with radiation such as diffraction, refraction, and internal radiation have been removed, and a new gas-surface interaction subroutine REFLCT, based upon the reciprocity relation, has been included. A detailed description of the input variables is given, as is a listing of control cards so that GUMRAP can be run on an IBM 370/165 computer by anyone desiring to analyze the molecular flow in complex systems such as space chambers. GRA

N80-22648# Argonne National Lab., Ill. Systems Engineering and Technology Group.
ANALYTICAL MODELING OF A HYDRIDE HEAT EXCHANGER
Jeffrey S. Horowitz Sep. 1979 40 p refs
(Contract W-31-109-eng-38)
(ANL/EES-TM-61) Avail: NTIS HC A03/MF A01

In order to obtain some of the parametric features of the problem of conduction in a hydride bed, a computer program was developed. For simplicity a one-dimensional slab with constant temperature boundary conditions was considered. The phase change corresponding to the adsorption/desorption of hydrogen was modeled as a sharp increase in specific heat at the phase change temperature. All other thermal properties were assumed to be constant with temperature. The computer program was used to solve a number of cases with the results put into dimensionless form. The results of these runs, and the conclusion to be drawn are discussed. DOE

N80-22649# Kentucky Univ., Lexington. Dept. of Mechanical Engineering.
BASIC RESEARCH ENGINEERING: FLUID DYNAMICS AND THERMAL PROCESSES
L. D. Conta and R. F. Hill Aug. 1979 28 p Workshop held at Lexington, Ky., 1-2 Feb. 1979 Prepared in cooperation with Engineering Societies Commission on Energy, Inc., Washington, D.C.
(Contract EF-77-C-01-2468)
(FE-2468-53) Avail: NTIS HC A03/MF A01

Specific research needs in fluid dynamics and thermal processes were identified during a workshop held to emphasize the importance of basic research in developing new technologies for meeting national energy problems. Specific research projects related to fluid dynamics, separation phenomena, energy processing, and energy reactions as well as programs for assessing the status of technology advancement in these fields and for making the results of these assessments accessible and useful to practicing engineers are recommended. DOE

N80-22650# Los Alamos Scientific Lab., N. Mex.
HEAT PIPE COMPUTER PROGRAM (HTPIPE) USER'S MANUAL
F. C. Prenger, Jr. Nov. 1979 45 p refs

(Contract W-7405-eng-36)
(LA-8101-M) Avail: NTIS HC A03/MF A01

Program HTPIPE is a hydrodynamic model of heat pipe performance. The program was developed for high-performance liquid metal heat pipes but can easily be adapted to other working fluids if thermal transport property values are known. Several liquid return geometries can be analyzed including homogeneous wick, screen covered grooves, circular arteries and gutters. The program can be used to optimize the heat pipe design, to calculate performance limits, and to determine axial temperature and pressure profiles. The program is written in FORTRAN and is operational on CDC-6000 series computers. Sample problems are included. DOE

N80-22651# Los Alamos Scientific Lab., N. Mex.
SYMPATHETIC DETONATION
Allen L. Bowman and David E. Richardson (Hercules, Inc., Magma, Utah) 1979 18 p refs Presented at the 16th CPIA-JANNAF Combust. Meeting, Monterey, Calif., 10 Sep. 1979 Sponsored in part by Navy
(Contracts W-7405-eng-36)
(LA-UR-79-2769; CONF-790975-2) Avail: NTIS HC A02/MF A01

The results of a combined experimental and theoretical study of sympathetic detonation of VRO propellant are summarized. The extent of sympathetic reaction has been determined experimentally for different sizes and shapes of propellant. The experiments have been modeled numerically using the LASL reactive hydrodynamic code 2DE with Forest Fire burn rates. The critical separation distance for high-order detonation had been calculated for the cylindrical equivalents of 1, 2, and 3 inch cubes, and is in excellent agreement with experiment. The calculated behavior of the total system is shown with a computer-generated movie, and details of the pressures in the air and in the acceptor are presented. DOE

N80-22652# Aeronautical Research Inst. of Sweden, Stockholm. Fluid Technology Lab.
FLEXNOZZLE STEERING OF ANALOG FLOW DIVERTERS
K. S. Nystroem (Sheffield Univ.) and R. F. Boucher 1979 53 p refs
(FFA-Memo-118) Avail: NTIS HC A04/MF A01

The concept of using a sharp-edged nozzle whose two edges are not parallel (nor necessarily straight) is shown to be effective in changing the Flexistor valve behavior from digital to analog. In the Flexistor valve the flow diversion between two outlets is achieved by small movement of one side of a two dimensional sharp-edged nozzle. Test measurements of flow division between the two outlets as a function of rotation of one side of the nozzle are presented for several geometries. Useful geometries giving a good analog function are noted. A feedback model developed as an aid to understanding the device behavior and as a design tool is described. This simple and continuous flow division is applicable to flows of liquids, slurries, or gases. A particularly useful area of application is that of by-pass where a controlled proportion of a fluid stream is diverted around a device. The device may, for example, be a heat exchanger. Because of the simplicity of Flexnozzle actuation a simple downstream temperature sensor/actuator is all that is required to close the loop for temperature regulation. Many similar by-pass situtations exist in process engineering. Author (ESA)

N80-22653# European Space Agency, Paris (France).
THE DETERMINATION OF THE LAVAL NOZZLE EXIT CONDITIONS AT A TOO HIGH COUNTER-PRESSURE ESPECIALLY FOR A PROPANE OXYGEN GAS GENERATOR
Egbert Riester Nov. 1978 65 p refs Transl. into ENGLISH of "Ermittlung des Austrittszustandes aus Lavalduesen bei zu Homen Gegendruck, Speziell bei einem Propan-Sauerstoff-Gasgenerator", Rept. DLR-FB-77-45 DFVLR, Brunswick, Sep. 1977 Original report in GERMAN previously announced as X79-71927
(ESA-TT-504-Rev; DLR-FB-77-45) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 21,60

The flow conditions in a supersonic nozzle including normal shock were investigated. A more dimensional calculation method for an ideal gas is presented to compute the nozzle exit parameters and the location of the shock. The boundaries of the pressure behind the nozzle were calculated. For gas from the combustion of propane and oxygen, it is shown that the consequences of real gas effects on the results of the method are small. Experimental measurements on nozzles with air flow show the validity of the method. At a propane oxygen gas generator, the exhaust temperature is very high; therefore, measurements are possible only in the jet behind the nozzle exit. The pilot pressure and the temperature measurements show that the chemical reaction in the combustion chamber was incomplete.
Author (ESA)

N80-22654# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
A THEORETICAL INVESTIGATION ON THE EFFECT OF THE PRESSURE STRAIN CORRELATIONS ON THE DEVELOPMENT OF THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS
Julius Christian Rotta Feb. 1979 77 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-618)
(DFVLR-FB-79-05) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 11,50

Two approximate formulas relating to the process of shear stress generation in three dimensional turbulent boundary layers were derived. The derivation makes use of the assumption that the mean products of pressure and rate of strain fluctuations contribute substantially to the directional differences of the resultant shear stress and the resultant mean rate of strain. Calculations are presented for turbulent boundary layers on infinite swept wings and the results are compared with experimental data. Author (ESA)

N80-22655# Delft Hydraulics Lab. (Netherlands).
BUBBLE CAVITATION IN RELATION TO LIQUID QUALITY
Daniel Marcus Oldenziel May 1979 296 p refs Submitted for publication
(Publ-211) Avail: NTIS HC A13/MF A01

Techniques to measure the cavitation strength in a flow are described. The techniques are based on the dynamics of a bubble in a liquid and on the theory of gas diffusion in liquids. The measuring instruments used in cavitation research are reviewed. Theoretical considerations of bubble dynamics in liquids are summarized and a mathematical model is presented which shows the effects of the quality of the liquid on the cavitation strength. A.W.H.

N80-22656# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
FINITE DIFFERENCE CALCULATION OF INCOMPRESSIBLE FLOW THROUGH A STRAIGHT CHANNEL OF VARYING RECTANGULAR CROSS SECTION, WITH APPLICATION TO LOW SPEED WIND TUNNELS
J. vanderVooren and A. Sanderse 26 Jun. 1979 30 p
(NLR-TR-77109-U) Avail: NTIS HC A03/MF A01

A fully-conservative finite difference algorithm is described to calculate the incompressible flow through a straight channel of varying rectangular cross section. Both the width and the height of the channel may vary independently. The algorithm was used successfully in the design of the German-Dutch low speed wind tunnel. Author (ESA)

N80-22657# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE IMPINGEMENT OF UNDEREXPANDED, AXISYMMETRIC JETS ON NORMAL AND INCLINED FLAT PLATES. VOLUME 1: TEXT
P. J. Lamont and B. L. Hunt Dec. 1977 75 p refs 2 Vol.
(Contract AT/2034/040GW)
Avail: NTIS HC A04/MF A01

The results of an extensive experimental study of the impingement of supersonic air jets upon a flat plate are presented. The supersonic jets were produced by a convergent-divergent nozzle with a conical exit section operated at two under-expansion ratios. The pressure distribution on the flat plate was recorded when the plate was set at distances between 0.5 and 15 exit diameters below the nozzle and inclined at angles to the jet

axis in the range from 90 deg to 30 deg. Shadowgraph pictures of the impinging flow field were taken for most cases. The pressure distribution results are of sufficient resolution to accurately define the plate pressure distributions in most cases. Analysis shows that a momentum method can predict the overall load normal to the flat plate at any inclination. Correlations between important parameters of the pressure distributions for normal impingement and certain free-jet characteristics were found, which may enable these parameters to be predicted in other free-jet conditions. Author (ESA)

N80-22658# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE IMPINGEMENT OF UNDEREXPANDED, AXISYMMETRIC JETS ON NORMAL AND INCLINED FLAT PLATES. VOLUME 2: FIGURES
P. J. Lamont and B. L. Hunt Dec. 1977 239 p 2 Vol.
(Contract AT/2034/040GW)
Avail: NTIS HC A11/MF A01

Figures generated in an extensive experimental study of the impingement of supersonic air jets upon a flat plate are presented. These include the pressure distribution on the flat plate and shadowgrah pictures of the impinging flow field. The pressure distribution results are of sufficient resolution to accurately define the plate pressure distributions in most cases. Analysis shows that a momentum method can predict the overall load normal to the flat plate at any inclination. Correlations between important parameters of the pressure distributions for normal impingement and certain free-jet characteristics were found, which may enable these parameters to be predicted in other free-jet conditions. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-22659# Aeronautical Research Labs., Melbourne (Australia).
AIRBORNE DATA PROCESSOR
K. F. Fraser and U. R. Krieser Nov. 1978 121 p refs
(ARL/Mech-Eng-153; AR-001-317) Avail: NTIS HC A06/MF A01

Airborne equipment developed for use in the acquisition and recording of both analog and digital data is described. These data are recorded using a single analog magnetic tape transport. A reference frequency, for use in servo-speed control of the ground station tape reproducing machine, is combined with speech using a balanced modulator. Recording of these data is performed using direct techniques. Up to eight channels of analog data, which may require measurement over large bandwidth (up to 20 kilohertz), are time multiplexed at rates which are variable over a wide range. Recording of the multiplexed data is performed using frequency modulation techniques. A highly stable crystal oscillator generates an input clock for a time code generator which provides time-of-day in digital form. Up to 32 channels of analog data, requiring measurement at relatively low bandwidth but at high accuracy, are time multiplexed and converted to digital form using commercially available airborne equipment. The digital output from the above equipment together with that from the time code generator and from up to two digital transducers are multiplexed digitally. The digital data are serialized and converted to a form suitable for recording using the analog tape machine. Author

N80-22660*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ALIASED NOISE IN RADIOMETRIC MEASUREMENTS
Friedrich O. Huck, Stephen K. Park, Nesim Halyo, and Steven T. Stallman May 1980 26 p refs
(NASA-TP-1639; L-13410) Avail: NTIS HC A03/MF A01 CSCL 14B

The magnitude of aliased noise that degrades the accuracy of continuous reconstructions of discrete radiometric measurements was evaluated as a function of the spatial response and sampling intervals of the radiometer, and of the resolution of the reconstructed measurements. A Wiener spectrum, representative of a wide range of scenes, was used to characterize the radiance fluctuations. E.D.K.

N80-22661*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN IMAGE READOUT DEVICE WITH ELECTRICALLY VARIABLE SPATIAL RESOLUTION Patent Application
Harry F. Benz, inventor (to NASA) Filed 28 Mar. 1980 12 p
(NASA-Case-LAR-12633-1; US-Patent-Appl-SN-135039) Avail: NTIS HC A02/MF A01 CSCL 14E

The use of a standing acoustic wave charge storage device as an image readout device is described. A frequency f sub 1 is applied to the storage transfer device to create a traveling electric field in the device in one direction along a straight line. A second frequency f sub 2 which is a harmonic of f sub 1, has the same amplitude, and is phase stable with f sub 1 and is applied to the charge transfer device to create a traveling electric field in the opposite direction. Consequently, a standing wave is created along the straight line. When an image is focussed on the charge transfer device, light is stored in the wells of the standing wave. When the frequency f sub 2 is removed, the stored charges are moved to an output terminal. This terminal is connected to a utilization device where the received charges represent the image on the surface of the charge transfer device along a projection of the straight line. NASA

N80-22662*# Applied Science Associates, Inc., Apex, N. C.
RADAR ALTIMETER MEAN RETURN WAVE FORMS FROM NEAR-NORMAL-INCIDENCE OCEAN SURFACE SCATTERING Final Report
George S. Hayne Wallops Island, Va. NASA. Wallops Flight Center Apr. 1980 27 p refs
(Contract NAS6-2810)
(NASA-CR-156864) Avail: NTIS HC A03/MF A01 CSCL 20N

For a nearly Gaussian transmitted pulse shape scattered from a nearly Gaussian distributed sea surface, a small argument series expansion of one term lead to a several term power series expression for the mean return waveform. Specific expressions are given for the first four terms. These results, which require less computer time than numerical convolution, are useful for data analysis from current or past radar altimeters and for design studies of future systems. Several representative results are presented for an idealized Seasat-1 radar altimeter. E.D.K.

N80-22663*# Applied Science Associates, Inc., Apex, N. C.
RADAR ALTIMETER MEAN RETURN WAVEFORMS FROM NEAR-NORMAL-INCIDENCE OCEAN SURFACE SCATTERING Final Report
George S. Hayne Wallops Island, Va. NASA. Wallops Flight Center Oct. 1979 26 p refs
(Contract NAS6-2810)
(NASA-CR-156864) Avail: NTIS HC A07/MF A01 CSCL 08C

Under assumptions common in radar altimetry, the mean backscattered return power for a short-pulse radar and near-normal-incidence scattering from a rough ocean surface is given by the convolution of several terms. For a nearly Gaussian transmitted pulse shape scattered from a nearly Gaussian distributed sea surface, a small-argument series expansion of one of the terms within the convolution leads to a several-term power series expression for the mean return waveform. Specific expressions are given for the first four terms. These results, which require much less computer time than would the otherwise necessary numerical convolution, are useful for data analysis from current or past radar altimeters and for design studies of future systems. Several representative results are presented for an idealized Seasat-1 radar altimeter. Author

N80-22664# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPACT PASSIVE LASER GYROSCOPE FEASIBILITY

INVESTIGATION M.S. Thesis
Raymond A. Motes Dec. 1979 74 p refs
(AD-A080155; AFIT/GE/EE/79-26) Avail: NTIS HC A04/MF A01 CSCL 17/7

The purpose of this research was to investigate the feasibility of a new passive laser gyro configuration. This new configuration consists of one small laser and five external mirrors, three of which make up the resonant cavity. A resonant cavity analysis was first done to determine the light wave propagation characteristics of a three mirror resonant ring. Error analysis was then used to determine the effects of various error sources on the output rotation rate measurements. Finally, the actual gyro was designed, built and tested. Rotation rate measurements were taken along with noise and long term bias drift measurements. Rotation measurements were taken from 0.1 deg/sec to 1.0 deg/sec with an RMS output noise of approximately 0.005 deg/sec. Long term bias drift measurements showed a bias drift, over a 30 minute period, of 0.03 deg/sec. Based on these measurements it was concluded that the new configuration is feasible. GRA

N80-22665# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Missile Structures Directorate.
OPTIMIZING A REAL TIME ACOUSTICAL HOLOGRAPHY SYSTEM
W. F. Swinson (Auburn Univ.) 1 Oct. 1979 53 p refs
(DA Proj. 1L1-62303-A-214)
(AD-A080656; DRSMI/RL-80-2) Avail: NTIS HC A04/MF A01 CSCL 14/5

This report documents work performed to improve a real time acoustical holography system used for the detection of flaws and disbonds in structures. The wave propagation phenomena and acoustical imaging techniques are discussed. A series of experiments were conducted to find optimum system alignment for improving image resolution. Sample real time acoustical holograms of flawed specimens are included in the work. A list of suggested system improvements is also given. GRA

N80-22666# Tri-Con Associates, Inc., Cambridge, Mass.
THE DESIGN OF MASS SPECTROMETER ASSEMBLIES FOR SPACE SHUTTLE LAUNCHED SATELLITES Final Report, Jun. 1978 - Sep. 1979
George P. Murphy Hanscom AFB, Mass. AFGL Sep. 1979 40 p refs
(Contract F19628-78-C-0150; AF Proj. 2310)
(AD-A080439; C-169; AFGL-TR-79-0233) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report discusses the development of instrumentation to be flown on satellites which will be launched from the space shuttle. The instrument is a quadrupole mass spectrometer designed to measure preselected masses in the 1 AMU to 50 AMU region. A discussion of the various circuits will be included in this report along with a complete set of schematics and drawings. GRA

N80-22667# Brookhaven National Lab., Upton, N. Y.
VACUUM ULTRA VIOLET MONOCHROMATORS
Malcolm R. Howells 1979 26 p refs Presented at Natl. Conf. on Synchrotron Radiation Instrumentation, Gaithersburg, Md., 4 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-26633; CONF-790651-7) Avail: NTIS HC A03/MF A01

The performance of vacuum ultraviolet monochromators, in particular the general classes of Rowland circle, plane grating, and the toroidal grating monochromators is examined. Approaches which hold the best promise for the future identified and the basis of these approaches and how they might be implemented is discussed. DOE

N80-22668# California Univ., Livermore. Lawrence Livermore Lab.
MICROPROCESSOR-CONTROLLED PORTABLE NEUTRON SPECTROMETER
G. F. Hunt, R. C. Kaifer, D. R. Slaughter, R. E. Strout, II, and D. W. Rueppel 29 Aug. 1979 8 p refs Presented at the IEEE Nucl. Sci. Symp., San Francisco, 18-20 Oct. 1979
(Contract W-7405-eng-48)
(UCRL-82716; CONF-791037-2) Avail: NTIS HC A02/MF A01

A neutron spectrometer that acquires and unfolds data in the field was developed for use in the energy range from 1 to 20 MeV. The system includes an NE213 organic scintillation detector, automatic gain stabilization, automatically stabilized pulseshape discrimination, an LSI-II microprocessor for control and data acquisition. The system, with the exception of the multichannel analyzer, is mounted in a suitcase 47 by 66 by 23.5 cm. The mass is 23/5 kg. DOE

N80-22669# Exxon Nuclear Idaho Co., Inc., Idaho Falls.
ULTRASONIC LIQUID-IN-LINE DETECTORS: DEVELOPMENT, EVALUATION, AND IMPLEMENTATION
T. C. Piper Oct. 1979 22 p refs
(Contract DE-AC07-79ID-01675)
(ENICO-1014) Avail: NTIS HC A02/MF A01

Ultrasonic liquid-in-line sensors designed and fabricated of 1/4 in. and smaller diameter tubing are discussed and evaluated. Problems of impedance matching and acoustic reflection are considered. Tone-burst excitation of piezoelectric crystals was found to be useful in producing sensors that behave predictably. DOE

N80-22670# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Nachrichtentechnik.
CONTRIBUTION TOWARDS AUTOMATIC INVESTIGATION AND PERCEPTION OF TEXTURE IN DIGITIZED REMOTELY SENSED IMAGES Ph.D. Thesis - Technische Univ.
Rudolf Fiedler Feb. 1979 246 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-621)
(DFVLR-FB-79-08) Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 45,80

The problems that arise from the automated analysis of texture in images are reviewed. Mathematical algorithms are presented for the determination of texture and borders as well as texture classification. The description makes use of the frequency dependence of the image structure that characterizes texture. The interactive digital image processing system, DIBIAS, which provided the images for the analysis is described. Author (ESA)

N80-22671# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Nachrichtentechnik.
ENHANCEMENT OF MULTISPECTRAL SCANNER IMAGES BY DIGITAL FILTERING Ph.D. Thesis - Technische Univ.
Peter Nowak Jan. 1979 159 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-624)
(DFVLR-FB-79-11) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 28

The possibilities of image restoration and image enhancement by means of two dimensional digital filtering were studied. The sensor system, possible distortions of the image signal, and the theory of nonrecursive digital filtering are discussed. Two design methods for digital filters are presented. The application of digital filtering to multispectral scanner imagery is described. Author (ESA)

N80-22672# AEG-Telefunken, Ulm (West Germany). Fachbereicht Roehren.
INVESTIGATION AND DEVELOPMENT OF A GAS-DISCHARGE MATRIX DISPLAY WITH INHERENT STORAGE Final Report
Manfred Schiekel, Kurt Fahrenschon, Willi Junge, Guenter Peppel, and Ruediger Unbehaun Bonn Bundesmin. fuer Forsch. u. Technol. Aug. 1979 126 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol. (BMFT-FB-T-79-25) Avail: NTIS HC A07/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 25,85

The physical principles and technology for a dc gas discharge matrix display with storage were investigated. The storage of the device is based on the dynamic properties of the discharge.

The display cells were addressed with pulses of less than 2 microseconds width making a limitation of the current with resistors unnecessary. In order to shorten the write-pulses, auxiliary discharges were used so as to supply the display cells with ions and metastables. The technology for fabricating devices of 100 x 100 sq mm was elaborated and a demonstration device was built. Author (ESA)

N80-22673# National Technical Information Service, Springfield, Va.
MAGNETOMETERS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Dec. 1979
George W. Reimherr Jan. 1980 231 p Supersedes NTIS/PS-78/1305; NTIS/PS-77/1184; NTIS/PS-76/1025; NTIS/PS-75/830 2 Vol.
(PB80-803752; NTIS/PS-78/1305; NTIS/PS-77/1184; NTIS/PS-76/1025; NTIS/PS-75/830) Avail: NTIS HC $30.00/MF $30.00 CSCL 14B

Abstracts of reports on the theory, design, performance, and calibration of various types of magnetometers are presented. Only equipment studies are included. This updated bibliography contains 224 abstacts, 23 of which are new entries to the previous edition. GRA

N80-22674# National Technical Information Service, Springfield, Va.
MAGNETOMETERS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Dec. 1979
George W. Reimherr Jan. 1980 220 p Supersedes NTIS/PS-78/1306; NTIS/PS-77/1185; NTIS/PS-76/1026 2 Vol.
(PB80-803760; NTIS/PS-78/1306; NTIS/PS-77/1185; NTIS/PS-76/1026) Avail: NTIS HC $30.00/MF $30.00 CSCL 14B

Reports from a worldwide literature survey concerning the theory, design, performance, and calibration of various types of magnetometers are presented. Only equipment studies are included. This updated bibliography contains 213 abstracts, 49 of which are new entries to the previous edition. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-22675 California Univ., Los Angeles.
A STUDY OF THE POLARIZATION CHARACTERISTICS OF STIMULATED EMISSION IN ORGANIC DYES Ph.D. Thesis
Kendall Charles Reyzer 1979 129 p
Avail: Univ. Microfilms Order No. 8008518

The polarization characteristics of stimulated emission in laser pumped organic dyes are analyzed. An arbitrary distribution of transition moments, saturation effects of the dye laser field, birefringence of the active medium due to operation away from line center, and rotational diffusion introduced by the Brownian motion of the molecules in solution are included in the analysis. Several applications are discussed including optoptic modulators, improved dye laser pumping efficiency, polarization selectability in dye lasers, and indirect measurement of the rotational diffusion time of a molecule in solution. Dissert. Abstr.

N80-22676 Illinois Univ. at Urbana-Champaign.
LUMINESCENCE CHARACTERISTICS OF SINGLE AND MULTIPLE ALUMINUM GALLIUM ARSENIDE - GALLIUM ARSENIDE QUANTUM-WELL HETEROSTRUCTURE LASERS Ph.D. Thesis
Robert Michael Kolbas 1979 140 p
Avail: Univ. Microfilms Order No. 8009077

The luminescence properties of single and multiple $Al_xGa_{1-x}As$-GaAs quantum-well heterostructure lasers grown by metalorganic chemical vapor deposition are examined. They are shown to differ markedly from those of conventional double hetero-junctions because of the two dimensional nature of the active region. The experimental characteristics of quantum-well recombination radiation are presented and are explained in terms of the properties of quantized carrier motion. Dissert. Abstr.

N80-22677 Columbia Univ., New York.
LASER LIGHT SCATTERING IN SURFACTANT SYSTEMS Ph.D. Thesis
Alan Michael Ganz 1979 186 p
Avail: Univ. Microfilms Order No. 8008725

Laser light scattering, a technique employing coherent radiation to examine macromolecular solution dynamics on he scale of the wavelength of light, was used to study the diffusion behavior of a variety of micelles formed by Triton X surfactants. Concentration dependent studies of the diffusion coefficients measured at 293 K were made in order to extrapolate a hydrodynamic radius for each micelle at infinite dilution. Laser light scattering in the presence of an external electric field - electrophoretic light scattering - is discussed. Results on the electrophoretic mobility of 1.1 micron polystyrene latex spheres using the light scattering chamber are examined. Dissert. Abstr.

N80-22678 Alabama Univ., University.
INVESTIGATION OF A POSSIBLE FLUID MIXING NUCLEAR PUMPED N2-CO2 LASER INCLUDING THE EFFECT OF ONE DIMENSIONAL FLOW Ph.D. Thesis
John Joseph Dearth 1979 90 p
Avail: Univ. Microfilms Order No. 8007591

Use of a fluid mixing system is proposed as a possible means to achieve a nuclear pumped CO2 laser. The system inherently avoids reported problems with electron diffusion pumping of the lower laser level and offers, in principle, to alleviate the reported need for enormous cooling flow rates. An N2-CO2 fluid mixing nuclear pumped system was examined by a one dimensional, constant uniform flow, vibrational temperature model, which was solved numerically. Dissert. Abstr.

N80-22679*# Laser Development Corp., Lexington, Mass.
DEVELOPMENT OF TUNABLE HIGH PRESSURE CO2 LASER FOR LIDAR MEASUREMENTS OF POLLUTANTS AND WIND VELOCITIES Contractor Report, Oct. 1977 - Jan. 1979
Jeffrey S. Levine, Michael Guerra, and Ali Javan Apr. 1980 24 p
(Contract NAS1-14885)
(NASA-CR-3274) Avail: NTIS HC A02/MF A01 CSCL 20E

The problem of laser energy extraction at a tunable monochromatic frequency from an energetic high pressure CO2 pulsed laser plasma, for application to remote sensing of atmospheric pollutants by Differential Absorption Lidar (DIAL) and of wind velocities by Doppler Lidar, was investigated. The energy extraction principle analyzed is based on transient injection locking (TIL) at a tunable frequency. Several critical experiments for high gain power amplification by TIL are presented. E.D.K.

N80-22680# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STUDY OF APPLICABILITY OF ITERATIVE SATURATED GAIN MODEL IN CONFOCAL UNSTABLE RESONATOR ANALYSIS M.S. Thesis
Russell G. Sorenson Dec. 1979 80 p refs
(AD-A080361; AFIT/GEO/PH/79D-2) Avail: NTIS HC A05/MF A01 CSCL 20/5

An existing method of calculating the eigenmodes of confocal unstable strip resonators is reviewed. This method has the advantage of accurately accounting for diffraction effects but is limited to inclusion of an arbitrary symmetric gain distribution. An extension of this method to include a realistic saturated gain distribution is proposed. This gain distribution is calculated numerically by using an iterative technique to arrive at a self-consistent solution for both the gain and field distributions. Several appendicies are presented to aid in understanding the basic theory. GRA

N80-22681# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
LASER ANNEALING OF AND LASER INTERACTIONS WITH ION IMPLANT SEMICONDUCTING MATERIALS M.S. Thesis
Kenneth Reed Bradley Dec. 1979 74 p refs
(AD-A080363; AFIT/GEP/PH/79D-1) Avail: NTIS HC A04/MF A01 CSCL 20/12

A Q-switched ruby laser was used to irradiate implanted and unimplanted GaAs and Si. Time resolved reflectivity

measurements, which determine the length of time that the surface of the sample is melted, were performed during the laser annealing process. The length of melt versus energy density was plotted for both the implanted and unimplanted samples. No difference in the melt time was observed between implanted and unimplanted samples at high energy densities. The threshold for melting in the implanted samples was found to be lower than the virgin samples, and the energy density required to produce melting in GaAs was about 2/5 that needed for Si. The results obtained were compared to reported experimental work and numerical calculation on laser annealing. Optical reflectivity techniques, performed by Lt. Mullins were used to determine the crystallinity of the samples after annealing. GRA

N80-22682# Electronics Research Lab., Adelaide (Australia).
THE INFLUENCE OF WATER TURBIDITY ON THE PERFORMANCE OF A LASER AIRBORNE DEPTH SOUNDER
D. M. Philips Apr. 1979 29 p refs
(AD-A074153; ERO-0072-TR) Avail: NTIS HC A03/MF A01 CSCL 08/10

During flight trials of a laser airborne depth sounder (WRELADS), measurements were made of the optical attenuation coefficient of coastal waters in both South Australia and Queensland. Measurements of the attenuation coefficient at wavelengths from 400 nm to 600 nm are reported for a range of different water types, and the suitability for depth sounding of the laser wavelength 532 nm is confirmed. Variations of the attenuation coefficient at 530 nm over two vertical sections of sea water are reported and factors influencing the turbidity are suggested. Return signals recorded by the depth sounder are compared with measured attenuation coefficients of the water. It is shown that the maximum measurable water depth varies from below 4 to above 10 attenuation lengths, depending on the turbidity of the water. GRA

N80-22683# Defence Research Establishment Valcartier (Quebec).
PERFORMANCE AND DIAGNOSTIC MEASUREMENTS OF A SUPERSONIC HCl CHEMICAL LASER
S. J. Arnold, K. D. Foster, and D. R. Snelling Jun. 1979 25 p refs In ENGLISH; FRENCH summary
(AD-A071352; DREV-R-4139/79) Avail: NTIS HC A02/MF A01 CSCL 20/5

A supersonic purely chemical continuous wave HCl laser is described in which nonequilibrium concentrations of atomic chlorine are generated by the branch-chain reaction of NO with ClO2. The ClO2 is injected into a stream of NO in helium immediately upstream of the throat of a slit nozzle. The reacting gases then expand as a free-jet into a low-pressure region where HI is added to rapidly form vibrationally excited HCl. The maximum HCl multiline output power of 35 W obtained represents a chemical efficiency of approximately 4.5% based on the total exothermicity of the pumping reaction and the limiting flow rate of HI. GRA

N80-22684# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PHASE SEQUENCE ESIMATION FOR LASER LINE-SCAN IMAGERY IN THE PRESENCE OF RAYLEIGH FADING M.S. Thesis
David E. Meer Dec. 1979 127 p refs
(AD-A080368; AFIT/GE/EE/79D-24) Avail: NTIS HC A07/MF A01 CSCL 17/8

An airborne laser line-scan imaging system can determine the relative range to a target by power modulation of the illuminating laser and detecting the relative phase of the reflected signal with respect to the modulation phase reference. The amplitude of the reflected signal may fluctuate greatly due to such factors as speckle noise and the varying reflectivity of the target, resulting in the severe degradation of performance of commonly used phase detection circuitry. In this report, a maximum-a posteriori (MAP) phase sequence estimator is developed based upon the Viterbi algorithm. The signal is observed in additive, zero mean, white Gaussian noise and the statistics of the amplitude are assumed to be Rayleigh. Perfect knowledge of each realization of the signal amplitude is assumed and the sensitivity to errors in the amplitude estimate is investigated. Expressions for approximate mean-squared error and a lower bound on mean-squared error are developed and verified by a Monte Carlo simulation of the estimator. GRA

N80-22685# Northrop Research and Technology Center, Palos Verdes Peninsula, Calif.
INVESTIGATION OF EFFICIENT CO LASER FREQUENCY TRIPLING Final Report
H. Komine, E. A. Stappaerts, and A. S. Gerwer Kirtland AFB, N.M. AFWL Sep. 1979 144 p refs
(Contract F29601-78-C-0068; AF Proj. 317J)
(AD-A080810; AD-E200437; NRTC79-13R; AFWL-TR-79-71) Avail: NTIS HC A07/MF A01 CSCL 20/5

A thorough study on the feasibility of efficient CO laser frequency tripling in molecular gases was completed. Computer code calculations of nonlinear susceptibilities and detailed analysis of efficiency limitations were carried out for nine candidate molecules belonging to three different resonant enhancement schemes. The results of the study show that direct frequency tripling would yield small efficiencies. However, a two step conversion process involving an intermediate frequency shifting may provide large enhancement factors for efficient two photon resonant sum frequency generation. GRA

N80-22686# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
SURFACE-HOPPING MODEL FOR NEAR-RESONANT ELECTRONIC ENERGY TRANSFER
Jeffrey I. Steinfeld and David G. Sutton 3 Jan. 1980 29 p refs
(Contract F04701-79-C-0080)
(AD-A081234; TR-0080(5940-01)-4; SD-TR-79-20) Avail: NTIS HC A03/MF A01 CSCL 20/5

A surface-hopping model was developed to account for the large near-resonant electronic energy transfer cross sections in systems such as NF-Bi and O2-I, in which the dipole-dipole mechanism is formally forbidden. Multiple surface crossings are predicted to occur in NF-Bi at distances of approximately 8 A, because of long-range (R to the -5th power) dipole-induced dipole terms in the potential. This corresponds well with the measured transfer cross section of approximately 200 sq A. These terms are absent in O2-I, so that the leading term is the London dispersion interaction with an R dependence of R to the -6th power. The predicted crossing distance is approximately 3.5 A, in agreement with the smaller transfer cross section for this system. A Landau-Zener crossing probability is used to predict the temperature dependence of the thermally averaged cross section Q(T) for the I-atom laser pumping reaction. Requirements for a more accurate calculation are discussed. GRA

N80-22687# California Univ., San Diego.
VARIABLE PARAMETER FREE ELECTRON LASER
N. M. Kroll, P. L. Morton (Stanford Univ.), and M. N. Rosenbluth (Inst. for Advanced Study) Oct. 1979 24 p refs
(Contracts EY-76-C-03-0515; DE-AC03-76SF-00515; MDA903-78-C-0086)
(SLAC-PUB-2371) Avail: NTIS HC A02/MF A01

The use of the free electron laser (FEL) to produce a high power laser beam is examined. The design of the wiggler magnet used for the FEL is discussed. The effect of the variations of the magnetic wiggler field and wave length on the coupling of the electron energy to the optical laser beam is discussed. DOE

N80-22688# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
TOUSCHEK LIFETIME FOR THE NSLS FREE ELECTRON LASER EXPERIMENT
Samuel Krinsky 1979 6 p refs Presented at the Workshop on Beam Current Limitations in Storage Rings, Upton, N.Y., 16-27 Jul. 1979
(Contract EY-76-C-02-0016)
(BNL-26668) Avail: NTIS HC A02/MF A01

The VUV-Ring designed to operate at an electron energy of 700 MeV with an average current of 1 Amp distributed in nine bunches is described. The use of the VUV-Ring for an experiment to study the operation of a free electron laser is discussed. For this purpose it is necessary to operate at an energy lower than 700 MeV, say 400 or 500 MeV. Since it is the peak current which determines the laser gain, it is hoped to achieve an average

current of 1 Amp distributed in three bunches, the length of a bunch being kept as short as possible. The combination of high peak current, small transverse dimensions, and low energy lead one to be concerned about the Touschek lifetime. In this note the Touschek lifetime for the free electron laser experiment is considered. DOE

N80-22689# California Univ., Livermore. Lawrence Livermore Lab.
THEORY AND SIMULATION OF LASER PLASMA COUPLING
W. L. Kruer 9 Aug. 1979 84 p refs
(Contract W-7405-eng-48)
(UCRL-83149) Avail: NTIS HC A05/MF A01

The theory simulation of laser plasma coupling processes are considered. Emphasis is given to their nonlinear evolution. The computerized simulation of plasmas using particle codes is given. The absorption of light via the generation of plasma waves is considered and a discussion of stimulated scattering of intense light is presented. DOE

N80-22690# Physical Sciences, Inc., Woburn, Mass.
INVESTIGATION OF CONCEPT OF EFFICIENT SHORT WAVELENGTH LASER Quarterly Progress Report, 1 Nov. 1978 - 31 Jan. 1979
R. H. Krech, L. G. Piper, E. R. Pugh, and R. L. Taylor Mar. 1979 16 p refs
(Contract ES-77-C-02-4223)
(COO-4223-7; PSI-TR-173) Avail: NTIS HC A02/MF A01

Quantitative analysis of data collected on the fluorescence emission (of lack thereof) from the UV photolysis of ClN3 is presented. The purpose of this investigation is to develop an efficient short wavelength laser based on a class of endoergic molecules (azides) with characteristics applicable to a laser fusion driver. It is found that there is essentially no fluorescence emission at 664.7 micron sec from ClN3 upon flash photolysis. Possible explanations for this anomalous result are considered. Progress on the solid azide laser demonstration experiment is reported. A discussion of initial experiments to detect ClN fluorescence at 665 microns and the supporting spectroscopy is given. DOE

N80-22691# Physics Lab. RVO-TNO, The Hague (Netherlands).
LIDAR: A STATISTICAL APPROACH
C. W. Lamberts Aug. 1978 47 p refs
(PHL-1978-31; TDCK-71317) Avail: NTIS HC A03/MF A01

Preliminary results are described for lidar experiments performed to obtain the optical parameters of the atmosphere under a variety of weather conditions. Software was developed to process either single shot measurements or a number of measurements statistically. It is shown that from the statistical approach a number of relations can be deduced between parameters obtained by lidar techniques and a number of atmospheric quantities recorded simultaneously with the lidar measurements. Author (ESA)

N80-22692# Physics Lab. RVO-TNO, The Hague (Netherlands).
TRANSFORMATION OF THE WAVELENGTH OF LASERS BY MEANS OF STIMULATED RAMAN SCATTERING (SRS)
M. J. M. vandeVen Nov. 1978 20 p refs
(Contract A71/KL/119)
(PHL-1978-44; TDCK-71520) Avail: NTIS HC A02/MF A01

It is shown that irradiation of the Raman active liquid CS2 with a short pulse 1.06 micrometers Nd-Yag laser results in wavelength conversion to larger infrared wavelengths by means of stimulated Raman scattering (SRS). The longer IR wavelengths are less harmful to the observer's eye. Contrary to previous experiments no stimulated Brillouin scattering (SBS) was observed to compete with the SRS process. Irridiation with a 1.06 micrometer pulse train shows both SRS and SBS radiation, thereby greatly reducing the conversion efficiency. Author (ESA)

N80-22693# Bureau of Radiological Health, Rockville, Md. Div. of Biological Effects.
BIOLOGICAL BASE FOR AND OTHER ASPECTS OF A PERFORMANCE STANDARD FOR LASER PRODUCTS
F. Alan Andersen Oct. 1979 31 p refs Revised
(PB80-128648; FDA/BRH-80/31; DHEW/PUB/FDA-80-8092) Avail: NTIS HC A03/MF A01 CSCL 06R

The biological basis for a performance standard for laser products is examined using the pattern of biological effects of light which are considered as hazardous to human health and safety. A classification of laser emissions is presented which defines the relative hazard of the emissions. The result of the classification scheme is four classes of laser products in the proposed laser product performance standard. The risks associated with accessible emission are discussed. GRA

N80-22694# National Technical Information Service, Springfield, Va.
X-RAY LASERS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1969 - 1979
Brian Carrigan Jan. 1980 100 p Supersedes NTIS/PS-79/0011; NTIS/PS-78/0004; NTIS/PS-76/0993
(PB80-803828; NTIS/PS-79/0011; NTIS/PS-78/0004; NTIS/PS-76/0993) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

Citations of Federally-funded research on the theory, design, development, testing, and output of X-ray lasers are presented. Studies on sources, excitation, amplification, pumping, tuning, and optimization of these lasers are included. This updated bibliography contains 93 abstracts, 5 of which are new entries to the previous edition. GRA

N80-22695# National Technical Information Service, Springfield, Va.
ULTRAVIOLET LASERS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1966 - 1979
Brian Carrigan Jan. 1980 216 p Supersedes NTIS/PS-79/0010; NTIS/PS-78/0003; NTIS/PS-76/0993
(PB80-803810; NTIS/PS-79/0010; NTIS/PS-78/0003; NTIS/PS-76/0993) Avail: NTIS HC $30.00/MF $30.00 CSCL 20E

Government-sponsored research on the design, development, theory, and diagnostics of ultraviolet lasers is cited. Studies on molecular reactions, electron transitions, excitation, tuning, and optical pumping of these systems are covered. Materials lasing in these wavelengths and optical equipment for these lasers are also included. This updated bibliography contains 209 abstracts, 23 of which are new entries to the previous edition. GRA

N80-22696# National Technical Information Service, Springfield, Va.
ACOUSTO-OPTICAL LASER MODULATORS AND DEFLECTORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1969 - Nov. 1979
Brian Carrigan Dec. 1979 112 p Supersedes NTIS/PS-78/1186; NTIS/PS-77/1071
(PB80-801368; NTIS/PS-78/1186; NTIS/PS-77/1071) Avail: NTIS HC $30.00/MF $30.00 CSCL 20F

Citations of Federally-funded research on acousto-optic equipment in laser beam modulation, filtering, scanning, deflection, switching, and tuning are covered. The uses of these acousto-optical devices in imaging, fiber optics, optical communications, optical radar, and measuring instruments are described. Research on carbon dioxide and dye lasers is included. This updated bibliography contains 103 abstracts, 5 of which are new entries to the previous edition. GRA

N80-22697# National Technical Information Service, Springfield, Va.
ACOUSTO-OPTICAL LASER MODULATORS AND DEFLECTORS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
Brian Carrigan Dec. 1979 117 p Supersedes NTIS/PS-78/1187; NTIS/PS77/1072
(PB80-801376; NTIS/PS-78/1187; NTIS/PS-77/1072) Avail: NTIS HC $30.00/MF $30.00 CSCL 20F

Abstracts of worldwide research on the theory and design of acousto-optical devices for laser beam modulation, deflection, splitting, mode locking, and tuning are presented. Studies on materials and their performance are covered. The applications of the acousto-optic interaction for the development of devices for optical information processing, optical modulators, switches, scanners, and color TV display systems are included. Simulation, testing, and performance of the equipment are also described.

This updated bibliography contains 112 abstracts, 17 of which are new entries to the previous edition. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-22698 Columbia Univ., New York.
OPTIMIZATION OF CAM-FOLLOWER SYSTEMS IN POLYDYNE CAM DESIGN Ph.D. Thesis
Nir Berzak 1979 296 p
Avail: Univ. Microfilms Order No. 8008702

High-speed polydyne cam-follower systems were analyzed. As a result of investigation of the structure of polynomial output motions satisfying prescribed terminal conditions, a method of representing the polynomial output motion as a function of independent parameters is outlined. Characteristics of the system are found to be inherent in the polynomial structure. Single degree-of-freedom mathematical models were used to represent the real system and the equation of motion with the aid of Laplace transformation. The relationship between the independent parameters and certain performance coefficients such as peak velocity, acceleration and shock of the output motion and initial velocity, acceleration and shock of the cam curve was established. Two methods of optimizations are presented: a point optimization and an optimization involving the matching of an entire motion. To assist the designer, guidelines in the form of a stepwise procedure are given for obtaining the optimal design.
Dissert. Abstr.

N80-22699 Dayton Univ., Ohio.
DIGITALLY-CONTROLLED, VARIABLE-RELUCTANCE LINEAR POSITIONING SYSTEM Ph.D. Thesis
Donald Ellis Graham 1979 140 p
Avail: Univ. Microfilms Order No. 8008433

An approach by which proportional, linear motion is produced directly by an electrically powered prime mover and controller and which uses a variable reluctance solenoid having either of two configurations: a single excitation coil and return spring; or a dual configuration of opposed solenoids is described. A model of the solenoid and feedback control system and the control strategy and its implementation in hardware and software are presented. Dissert. Abstr.

N80-22700*# Boeing Commercial Airplane Co., Seattle, Wash.
TESTING OF RECIPROCATING SEALS FOR APPLICATION IN A STIRLING CYCLE ENGINE
J. F. Curulla and T. L. Beck Feb. 1980 76 p refs
(Contract NAS3-20612)
(NASA-CR-159820; DOE/NASA/0612-80/1; BCAC-D6-48915) Avail: NTIS HC A05/MF A01 CSCL 11A

Six single stage reciprocating seal configurations to the requirements of the Stirling cycle engine were evaluated. The seals tested were: the Boeing Footseal, NASA Chevron polyimide seal, Bell seal, Quad seal, Tetraseal, and Dynabak seal. None of these seal configurations met the leakage goals of .002 cc/sec at helium gas pressure of 1.22 x 10 to the 7th power PA, rod speed of 7.19 m/sec peak, and seal environmental temperature of 408 K for 1500 hours. Most seals failed due to high temperatures. Catastrophic failures were observed for a minimum number of test runs characterized by extremely high leakage rates and large temperature rises. The Bell seal attained 63 hours of run time at significantly lowered test conditions. E.D.K.

N80-22701*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC RESPONSE TO ROTATING-SEAT RUNOUT IN NON-CONTACTING FACE SEALS
I. Etsion Apr. 1980 25 p refs
(NASA-TM-81490; E-392) Avail: NTIS HC A02/MF A01 CSCL 11A

The dynamic response of a flexibly mounted ring to runout of the rotating seat in mechanical face seals is analyzed assuming small perturbations. It is found that tracking ability of the stator depends only on its dynamic characteristics and operating conditions and is not affected by the amount of runout. Three different modes of dynamic response are shown and the condition for parallel tracking is presented. Author

N80-22702*# Kumm (Emerson L.), Tempe, Ariz.
DESIGN STUDY OF FLAT BELT CVT FOR ELECTRIC VEHICLES
Emerson L. Kumm Mar. 1980 159 p refs
(Contract DEN3-114; Contract EC-77-A-31-1044)
(NASA-CR-159822; P-1006) Avail: NTIS HC A08/MF A01 CSCL 13I

A continuously variable transmission (CVT) was studied, using a novel flat belt pulley arrangement which couples the high speed output shaft of an energy storage flywheel to the drive train of an electric vehicle. A specific CVT arrangement was recommended and its components were selected and sized, based on the design requirements of a 1700 KG vehicle. A design layout was prepared and engineering calculations made of component efficiencies and operating life. The transmission efficiency was calculated to be significantly over 90% with the expected vehicle operation. A design consistent with automotive practice for low future production costs was considered, together with maintainability. The technology advancements required to develop the flat belt CVT were identified and an estimate was made of how the size of the flat belt CVT scales to larger and smaller design output torques. The suitability of the flat belt CVT for alternate application to an electric vehicle powered by an electric motor without flywheel and to a hybrid electric vehicle powered by an electric motor with an internal combustion engine was studied. E.D.K.

N80-22703*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
OPEN ENDED RATCHET TYPE TUBING CUTTER Patent Application
Anthony S. Girala, inventor (to NASA) Filed 9 Apr. 1980 19 p
(NASA-Case-MSC-18538-1; US-Patent-Appl-SN-138944) Avail: NTIS HC A02/MF A01 CSCL 13I

A self-clamping tube and piping cutting tool requiring limited angular motion is described. It includes a handle attached to a C-shaped housing and has an opening sized to admit a pipe. Rotatably mounted within the housing is a C-shaped tool body carrying a set of clamping and support rolls and an edged cutting roll. These rolls contact a pipe at three circumferential points. Cutter advancing means advance the cutting roll toward the support rollers. The support rolls and cutting roll are rotatable independently of the C-shaped housing. A one way ratchet mechanism disposed between the C-shaped housing and the C-shaped tool body permits operation by movement in one rotational direction about the pipe axis. In another embodiment, the tool body is rotated by a power driven mechanism. In addition, an automatic cutter advancing means can be provided. NASA

N80-22704*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MECHANICAL END JOINT SYSTEM FOR STRUCTURAL COLUMN ELEMENTS Patent Application
Harold G. Bush and Richard E. Wallsom, inventors (to NASA) (Vought Corp., Hampton, Va.) Filed 5 Dec. 1979 17 p
(NASA-Case-LAR-12482-1; US-Patent-Appl-SN-100611) Avail: NTIS HC A02/MF A01 CSCL 13I

A mathematical end joint system, useful for the transverse connection of strut elements to a common mode is described. Included are node joint half with semicircular tongue and groove and a strut joint half with semicircular tongue and groove. The two joint halves were engaged transversely and the connection was made secure by the inherent physical property characteristics of locking latches or by a spring-actioned shaft. A quick release mechanism is also described which provides rapid disengagement of the joint halves. NASA

N80-22705*# National Aeronautics and Space Administration, Washington, D. C.
ALGORITHM FOR THE STABILIZATION OF MOTION A BOUNDING VEHICLE IN THE FLIGHT PHASE
V. V. Lapshin Jan. 1980 39 p refs Transl. into ENGLISH of "Algoritm Stabilizatsii Dvizheniya Prygayushchego Apparatav Faze

Poleta" Preprint-50, Acad. of Sci. USSR, Inst. of Applied Math. Imeni M. v. Keldysh, Moscow, 1979 p 1-63 Translation was announced as N80-10497 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75695; Preprint-50) Avail: NTIS HC A03/MF A01 CSCL 13I

The unsupported phase of motion of a multileg bounding vehicle is examined. An algorithm for stabilization of the angular motion of the vehicle housing by change of the motion of the legs during flight is constructed. The results of mathematical modeling of the stabilization process by computer are presented. E.D.K.

N80-22706# Shaker Research Corp., Ballston Lake, N. Y.
ROTOR-BEARING DYNAMICS TECHNOLOGY DESIGN GUIDE. PART 7: BALANCING Interim Report, 15 Apr. 1976 - 15 Jun. 1979
D. S. Wilson, E. J. Gunther, A. B. Palazzo, L. E. Barrett, and P. E. Allaire Wright-Patterson AFB, Ohio AFAPL Jun. 1979 159 p refs
(Contract F33615-76-C-2038; AF Proj. 3048)
(AD-A080562; SRC-79-TR-Pt-7) Avail: NTIS HC A08/MF A01 CSCL 13/9

This report summarizes the current technology in balancing rigid and flexible rotors. Balancing machines, balancing criteria and techniques, and the influence of shaft flexibility are discussed. GRA

N80-22707# Oak Ridge National Lab., Tenn.
STRESSES IN REINFORCED NOZZLE-CYLINDER ATTACHMENTS UNDER EXTERNAL MOMENT LOADINGS ANALYZED BY THE FINITE-ELEMENT METHOD: A PARAMETER STUDY
J. W. Bryson, W. G. Johnson, and B. R. Bass Aug. 1979 130 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0506; ORNL/NUREG-52) Avail: NTIS HC A07/MF A01

A parameter study was conducted on stresses in reinforced nozzle to cylinder attachments under external moment loadings as analyzed by the finite element method. Twenty five models were investigated. A three dimensional finite element program, CORTES-SA was used in the study. Each of the 25 models was analyzed for 6 individually applied external moment loadings, with 3 mutually orthogonal moment loadings on the nozzle end and 3 on the cylinder. Two of the nozzle reinforcement designs examined wear nozzle thickening or standards reinforcement 30 deg and triangular pad reinforcement. Essentially unreinforced models were also included for comparison. DOE

N80-22708# Battelle Columbus Labs., Ohio.
STRESS INDICES AND FLEXIBILITY FACTORS FOR NOZZLES IN PRESSURE VESSELS AND PIPING
E. C. Rodabaugh and S. E. Moore Jun. 1979 91 p refs
(Contract W-31-109-eng-38)
(NUREG-CR-0778; ORNL/Sub-2913/10) Avail: NTIS HC A05/MF A01

Maximum stress intensities and flexibility factors for isolated nozzles in cylindrical portions of vessels and in straight pipe are evaluated. The computer generated data, along with other available test and/or calculated data, are used to develop correlation equations for use in the code. Recommendations for code changes are included. DOE

N80-22709# California Univ., Livermore. Lawrence Livermore Lab.
PROOF LOAD DETERMINATION FOR PRESSURE VESSELS WOUND WITH ARAMID FIBER
H. Thomas Hahn 3 Jul. 1979 35 p refs Presented at the ASTM Symp. on Test Methods and Design Allowables for Fibrous Composites, Dearborn, Mich., 3-4 Oct. 1979
(Contract W-7405-eng-48)
(UCRL-82643; CONF-791019-1) Avail: NTIS HC A03/MF A01

A method of determining the proof pressure that can guarantee a design lifetime for Kevlar-49/epoxy pressure vessels is presented. The method is based on the assumption that, when taken from the same population, a statically strong vessel is also strong in stress-rupture. The lifetime data available at higher pressures are extrapolated to estimate the lifetime distributions at lower pressures. It is assumed that the lifetime distribution is exponential and that the characteristic lifetime is related exponentially to the applied pressure divided by the average burst pressure. Two examples are given to illustrate the method. DOE

N80-22710# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
THE DIFFUSION OF WATER VAPOR IN HUMID AIR INTO THE BONDLINES OF ADHESIVELY BONDED METAL JOINTS
Walter Althof Feb. 1979 81 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-619)
(DFVLR-FB-79-06) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15,40

The moisture content for five aircraft structural adhesives was determined as a function of environment and exposure time. The coefficient of diffusion was calculated and the correlation between the moisture content in the adhesive at saturation and the atmospheric humidity was estimated. Formulas to calculate the time dependent distribution of moisture in adhesive bonds are presented and their predictions are compared with experimental data. Author (ESA)

N80-22711# Rolls-Royce Ltd., Derby (England).
A RAY THEORY APPROACH FOR HIGH-FREQUENCY ENGINE-INTAKE NOISE
A. J. Kompton 1979 8 p refs Presented at Symp. on Mech. of Sound Generation in Flows, Goettingen, West Germany, 1979
(PNR-90001) Avail: NTIS HC A02/MF A01

The feasibility of incorporating a ray theory approach to the prediction of high frequency engine intake noise is demonstrated. Ray theory is used to model the propagation of the forward radiated broadband fan noise of a typical high bypass ratio aircraft engine. The use of ray theory to assess the effects of different liners on fan noise is discussed. Author (ESA)

N80-22712# Rolls-Royce Ltd., Derby (England). Engine Div.
MANUFACTURING OF ACOUSTIC LINERS FOR THE GAS TURBINE ENGINE
K. Bird 1979 13 p
(PNR-90003) Avail: NTIS HC A02/MF A01

The fabrication of a honeycomb divider between a plain support structure and a porous facing sheet is described. The machining and cutting of the honeycomb slab after immobilization with wax or by ice are described. Electrodischarge machining (spark machining) to perforate the sheet is discussed. Quality control using X-ray examination is shown. Author (ESA)

N80-22713# Rolls-Royce Ltd., Derby (England). Aero Div.
WEAR PARTICLE MONITORING
P. A. Mucklow 1979 27 p refs Presented at Condition Monitoring Res. and Develop. Group of Brit. Inst. of Non-Destructive Testing, 20 Feb. 1979
(PNR-90006) Avail: NTIS HC A03/MF A01

The effectiveness of monitoring systems presently used in aircraft gas turbines is discussed, and the sample analysis procedures are described. Systems which monitor wear particles in the oil through microscopic examination, debris quantification, alloy identification, and ferrography are examined. The practice of collecting and examining particles in the engine gas stream is described. Remote monitoring systems which provide a warning of the presence of wear without the need for regular inspection are discussed. Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-22714*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATION OF TRANSDUCER-COUPLANT EFFECTS ON BROADBAND ULTRASONIC SIGNALS
Alex Vary 1980 36 p refs Presented at Spring Meeting of the Am. Soc. of Nondestructive Testing, Philadelphia, 24-27 Mar. 1980
(NASA-TM-81489; E-427) Avail: NTIS HC A03/MF A01 CSCL 14D

The increasing use of broadband, pulse-echo ultrasonics in nondestructive evaluation of flaws and material properties has generated a need for improved understanding of the way signals are modified by coupled and bonded thin-layer interfaces associated with transducers. This understanding is most important when using frequency spectrum analyses for characterizing material properties. In this type of application, signals emanating from material specimens can be strongly influenced by couplant and bond-layers in the acoustic path. Computer synthesized waveforms were used to simulate a range of interface conditions encountered in ultrasonic transducer systems operating in the 20 to 80 MHz regime. The adverse effects of thin-layer multiple reflections associated with various acoustic impedance conditions are demonstrated. The information presented is relevant to ultrasonic transducer design, specimen preparation, and couplant selection. Author

N80-22715# Southwest Research Inst., San Antonio, Tex.
RESEARCH AND DEVELOPMENT OF NMR METHODS FOR THE NONDESTRUCTIVE CHARACTERIZATION OF INTERNAL STRESS AND STRAIN IN NONFERROMAGNETIC STRUCTURAL MATERIALS Final Technical Report, 1 Jun. 1976 - 31 Oct. 1979
G. A. Matzkanin 31 Dec. 1979 65 p refs
(Contract F44620-76-C-0114; AF Proj. 2306)
(AD-A080092; AFOSR-80-0106TR) Avail: NTIS HC A04/MF A01 CSCL 20/1

Two new nondestructive evaluation (NDE) methods for measuring residual stress in non-ferromagnetic metals have been investigated, namely, inductive nuclear magnetic resonance (NMR) and nuclear acoustic resonance (NAR). In metals, NMR is restricted to the surface by the electromagnetic skin effect while NAR is sensitive to the interior of the specimen as well as the surface. Results of NAR experiments on plastically deformed polycrystalline aluminum specimens were very encouraging. The NAR signature was found to vary with degree of plastic deformation in agreement with published NMR theory based on strain-induced quadrupole interactions. Shapes of the NAR signals from deformed aluminum were found to depend on the magnetic modulation frequency; it is suggested that this modulation dependence could form the basis for determining distributions of internal stress and strain in metals. Pulsed NMR experiments on bulk aluminum specimens were complicated by large electromagnetically generated acoustic transient signals not associated with nuclear resonance. Digital subtraction signal processing was used to discriminate against the spurious signals; however, it did not separate NMR signals from the electromagnetically generated transients. Pulsed NMR signals observed from aluminum in a powdered specimen of the superalloy IN-100 provides a basis for considering NMR and NAR for nondestructive measurements in this important class of alloys. GRA

N80-22716# Naval Surface Weapons Center, Dahlgren, Va.
ULTRASONIC C-SCAN TESTING OF MK38 MISSILE WARHEAD WELDMENTS Final Report
C. W. Anderson Jul. 1979 33 p refs
(AD-A075744; NSWC/TR-79-266) Avail: NTIS HC A03/MF A01 CSCL 13/5

The nondestructive determination of weld fusion for Mk38 Sparrow missile warhead casing weldments is discussed. The use of an ultrasonic C-scan technique is described, and the results are compared with destructive testing. Limitations imposed by geometric and dimensional tolerance considerations are also presented. The C-scan technique provides an accurate mapping of lack of fusion within the forward weld root and the aft weld sidewalls. The task is part of a larger effort to correlate weld geometry with weld strength to determine minimum weld requirements. GRA

N80-22717# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
STUDY OF NONDESTRUCTIVE EVALUATION METHODS FOR LAYERED STRUCTURES Final Technical Report, 1 Dec. 1978 - 31 Jul. 1979
N. K. Batra, C. M. Ekas, and J. S. Laffler Wright-Patterson AFB, Ohio AFML Nov. 1979 141 p refs
(Contract F33615-77-C-5022; AF Proj. 2418)
(AD-A080969; SRL-6492; AFML-TR-79-4162) Avail: NTIS HC A07/MF A01 CSCL 14/2

Acoustic parameters of adhesively bonded layered structures were extracted from experimental CW spectra. Computer software was developed which yielded the best fit of the experimental spectra of such structures to theoretical spectra generated from the theoretical model of layered structures. The acoustic parameters for such a fit then corresponded to the structures under study. A sampled CW Doppler effect technique was developed to measure radial bolt-hole cracks under the fasteners in single- and multi-layered adhesively bonded structures. This technique measures the size of the cracks far more accurately than any of the previously used amplitude or time delay methods. An Ultrasonic Pseudorandom Signal Correlation System was designed, fabricated, and experimentally characterized. This type of instrument may be useful in applications where high signal-to-noise ratios are not obtainable by conventional methods. GRA

N80-22718# Union Carbide Corp., Oak Ridge, Tenn. Mathematics and Statistical Research Dept.
RISK ANALYSIS RELIABILITY
V. R. R. Uppuluri 1979 12 p refs Presented at the 1979 DOE Statistics Symp., Gatlinburg, Tenn., 24 Oct. 1979
(Contract W-7405-eng-26)
(CONF-791016-1) Avail: NTIS HC A02/MF A01

The mathematical foundations of risk analysis are addressed. The importance of having the same probability space in order to compare different experiments is pointed out. The following topics are discussed: consequences as random variables with infinite expectations; the phenomenon of rare events; series-parallel systems and different kinds of randomness that could be imposed on such systems; and the problem of consensus of estimates of expert opinion. DOE

N80-22719# Sandia Labs., Albuquerque, N. Mex.
APPLICATIONS OF QUALITY ASSURANCE/QUALITY CONTROL CONCEPTS TO NON-HARDWARE PROJECT MANAGEMENT
Joseph F. Calek Oct. 1979 63 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1921) Avail: NTIS HC A04/MF A01

The concepts of quality assurance and quality control, developed over 40 years ago for high quantity production of hardware, are now routinely and effectively applied to complex one-of-a-kind projects such as design and construction of nuclear power plants. Currently, quality assurance and quality control are being applied to projects where outputs are less tangible, e.g., software, services, technical judgements. To date, this latest application has resulted in some notable successes. DOE

N80-22720# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
REQUIREMENTS FOR A COMPONENT QUALITY-CONTROL AND PROCUREMENT PROGRAM
Paris ESA Nov. 1979 22 p
(ESA-PSS-54/QRC-01-ESTEC-Iss-1) Avail: NTIS HC A02/MF A01

A specification is presented which sets forth the minimum requirements of a component quality control and procurement program applicable to projects of the European Space Agency. It is to be applied by contractors and sub-tier contractors to all ESA contracts for development, fabrication and delivery of spacecraft and associated equipment in which the use of

components with specific reliability/quality requirements is mandatory. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-22721 Northwestern Univ., Evanston, Ill.
SMALL-SCALE YIELDING AT CRACK TIPS IN PLATES AND SHELLS Ph.D. Thesis
Thomas Arthur Bubenik 1979 131 p
Avail: Univ. Microfilms Order No. 8007358

Deformation theory is used to model plastic deformation at the tips of cracks in flat plates and shells of arbitrary curvature. The plates and shells are thin, and the material exhibits strain hardening which is modeled by the use of a nonlinear stress-strain law. The deformation in the vicinity of the crack tips includes both stretching and bending, but the stretching is assumed to dominate. Thus, the stresses are tensile but with a nonuniform distribution through the thickness. This distribution depends on the material properties as well as on the geometry. The nonlinear near tip fields are singular and they are analyzed asymptotically. Assuming small scale yielding, path independent integrals, which are valid in regions close to the crack tips, are used to find the stress intensity factors by connecting the nonlinear near tip fields with the singular parts of the corresponding linearly elastic fields. Dissert. Abstr.

N80-22722 Northwestern Univ., Evanston, Ill.
STATIC AND DYNAMIC FRACTURE ANALYSIS FOR BONDED DISSIMILAR MATERIALS Ph.D. Thesis
Shiao-Hua Chen 1979 131 p
Avail: Univ. Microfilms Order No. 8008157

An elastodynamic problem for a steadily moving crack parallel to the bond plane of two bonded dissimilar materials is investigated and the stress intensity factors are given for parameters of material combinations, crack interface distance, and the crack moving speed. An interface crack, which is subjected to a combined loading with a dominant tensile loading such that there is no overlapped crack tip, is considered with the assumption that a cohesive zone exists ahead of the crack tip. By appropriately prescribing boundary conditions in the cohesive zone, the problem is solved and a failure criterion is proposed. The problem of the delamination of an interface crack due to a vertical crack which has one tip intersect the interface and is subjected to pressure loading, is studied. A prediction is made for the tendency of the propagation of the crack. An application of this model to the features of a geophysical crack, which is used for heat extraction, is briefly discussed. Dissert. Abstr.

N80-22723 Engineering Sciences Data Unit, London (England).
ENDURANCE OF RIVETED LAP JOINTS (ALUMINUM ALLOY SHEET AND RIVETS)
1979 21 p
(ESDU-79031; ISBN-0-85679-279-0; ISSN-0141-3996) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC $578.50

Fatigue endurance data is provided for riveted lap joints in aluminum alloy sheet. Life estimations of lightweight structures for aircraft, lightweight surface vessels, and other vehicles can be made from the data. The range of applicability is for aluminum alloy sheets and rivets where the geometrical ratios are in the ranges d/t = 1.9 to 4.4, p/l = 0.5 to 2.3 and p/d = 3.1 to 12.9. ESDU (GRA)

N80-22724 Engineering Sciences Data Unit, London (England).
STRESS CONCENTRATIONS AT GROOVES FOR RETAINING RINGS OR SEALS (WITH NOTES ON DESIGN AGAINST FATIGUE)
1979 10 p
(ESDU-79032; ISBN-0-85679-281-0; ISSN-0141-4089; ISSN-0141-4097) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC $290.50

The maximum stress arising in circumferentially grooved cylindrical members under tension, bending, or torsion is discussed. Guidance is given for using the data for estimating the fatigue strength. Applications include gear box shafts carrying retaining rings, and pipes using O seals at junctions with emphasis on elastic isotropic materials; groove proportions of depth to width ratio between 0.5 and 6.0 and radius to depth ratio between 0.2 and 0.03; and external to internal grooves of depth less than 1/5 of wall thickness but whose depth is small in relation to the diameter. ESDU (GRA)

N80-22725 California Univ., Los Angeles.
BEAM AND PLATE FINITE ELEMENTS INCLUDING TRANSVERSE SHEAR AND ROTARY INERTIA Ph.D. Thesis
Alexander Tessler 1979 187 p
Avail: Univ. Microfilms Order No. 8008541

A hierarchy of conforming Timoshenko-type beam elements, and conforming and nonconforming isoparametric quadrilateral Mindlin-type plate elements are developed. The element formulations employ the transverse deflection and bending rotation kinematic variables. The concept of interdependent variable interpolations is introduced which provides the basic strategy for constructing suitable kinematic variable interpolations. Two types of beam elements are derived: virgin and constrained elements. The advantages of a shear constant method over a static condensation procedure are discussed. Numerical solutions for static and free vibration problems are presented. The plate elements include conforming 21 degrees-of-freedom (DOF) elements and nonconforming 16 DOF elements. Static and free vibration analyses are carried out for isotropic homogeneous plates. Dissert. Abstr.

N80-22726 Pennsylvania Univ., Philadelphia.
CUMULATIVE FATIGUE DAMAGE IN COPPER POLYCRYSTALS Ph.D. Thesis
Juan Carlos Figueroa 1979 172 p
Avail: Univ. Microfilms Order No. 8009403

The physical basis of cumulative fatigue damage in a representative wavy slip material (copper) was investigated. The cyclic history effects and its resultant bulk dislocation substructures on the crack initiation and crack propagation mechanisms are highlighted. Push-pull tests with zero mean strain (or load), under plastic strain control conditions were carried out, and two amplitudes were selected. Dissert. Abstr.

N80-22727 Ohio State Univ., Columbus.
AN UPPER-BOUND ANALYSIS OF INELASTIC DEFORMATION IN TEXTURED HEXAGONAL POLYCRYSTALS (ZIRCALOY) Ph.D. Thesis
Brent Larsen Adams 1979 106 p
Avail: Univ. Microfilms Order No. 8008755

The inelastic deformation behavior of highly textured hexagonal metals is modelled by statistically weighting single crystal behavior over the range of orientations found in the polycrystal. Crystallographic texture is quantitatively specified with the crystallite orientation distribution function determined from a harmonic analysis of X-ray pole figure data. Power law creep under multiaxial loading conditions is modelled using a uniform strain rate upper bounding procedure which considers the effects of grain to grain in compatibility. Two distinct textures are modelled: a radial texture typical of fully annealed Zircaloy strip, and a bimodal texture typical of cold worked stress relieved Zircaloy tubing. The effects of stress free sources of strain-rate induced by preferred absorption of irradiation defects is considered in a model employing grain shape and size as well as fabrication Q-ratio as input parameters. The predicted behavior is shown to be very sensitive to grain shape. Interaction effects expected between creep and irradiation induced inelastic strain sources were investigated. Dissert. Abstr.

N80-22728 Northwestern Univ., Evanston, Ill.
A DISLOCATION DENSITY APPROACH TO FRACTURE AND FATIGUE Ph.D. Thesis
Carl Richard Vilmann 1979 107 p

Avail: Univ. Microfilms Order No. 8008178

The plastic flow at the crack tip was characterized by two separate models both compatible with slip line theory. One model assumes the crack geometry to be slit like while the other assumes the tip to be blunted into a semicircle. Each model allows the stress field within the plastic zone to be determined. A relationship is presented by which the stress field within the plastic zone is related to a distribution of potent, producing stress and displacement, dislocations. A thermodynamic approach was used to derive a fracture criteria for each model. Dissert. Abstr.

N80-22729 Michigan Univ., Ann Arbor.
UNILATERAL CONSTRAINTS IN FRACTURE AND CONTACT PROBLEMS Ph.D. Thesis
David William Schmueser 1979 167 p
Avail: Univ. Microfilms Order No. 8007830

Fracture and contact problems in solid mechanics involving unilateral constraints, or boundary conditions in the form of inequalities are discussed. A crack problem is considered which consists of an interface crack in a combined tension or compression and shear field. Both tensile and compressive normal loads are considered and numerical results for the contact zone extents, interface crack opening profiles, and stress intensity factors are presented. A periodic array of interface cracks is considered as a simple model for interface crack interaction in a second problem. Crack opening profiles and stress intensity factors are presented for various combinations of shear and tension compression loads. Dissert. Abstr.

N80-22730 California Univ., Los Angeles.
PARAMETER ESTIMATION IN STRUCTURAL DYNAMICS MODELS Ph.D. Thesis
David Richard Martinez 1979 294 p
Avail: Univ. Microfilms Order No. 8008503

A method is presented for the estimation of parameters in structural dynamics models. A detailed development of the filter and transformation equations is presented, followed by a discussion of the measurement noise characteristics for the practical case, as well as the simulated data used in the numerical study. Results are given for the several cases of an example problem, demonstrating the effectiveness of the method. Following the conclusions are suggestions for future research. Dissert. Abstr.

N80-22731 Missouri Univ. -Rolla.
A FINITE-ELEMENT FRACTURE PROPAGATION STUDY Ph.D. Thesis
Herbert George Smith, Jr. 1979 88 p
Avail: Univ. Microfilms Order No. 8008403

The question of fracture propagation is treated with the finite element method. A combined strain energy density-maximum tangential stress theory is used to predict element failure in an iterative process. After fracture, a stress relief method allows the element to resist shear and normal compressive loads while not resisting normal tensile loads (normal loads in this case referring to that direction perpendicular to the axis of the crack). The procedure requires no special or hybrid elements. Dissert. Abstr.

N80-22732 Illinois Univ. at Urbana-Champaign.
FINITE ELEMENT ANALYSIS OF A DYNAMICALLY LOADED FLAT LAMINATED PLATE Ph.D. Thesis
Daniel William Pillasch 1979 109 p
Avail: Univ. Microfilms Order No. 8009131

A finite element structural model was developed for the dynamic analysis of laminated, thick plates. The model uses quadrilateral elements to represent the shape of the plate and the elements are stacked in the thickness direction to represent various material layers. Nonlinear strain displacement relations were used to represent large transverse plate deflection. A finite difference technique was used to perform the numerical time integration. Assumptions were made about the response through the thickness of the plate that allow for the use of relatively large time increments in the numerical integration method. The results from the analytical model were compared with experimental results. Dissert. Abstr.

N80-22733*# Mechanical Technology, Inc., Latham, N. Y.
DEVELOPMENT OF PROCEDURES FOR CALCULATING STIFFNESS AND DAMPING OF ELASTOMERS IN ENGINEERING APPLICATIONS, PART 6
A. Rieger, G. Burgess, and E. Zorzi Apr. 1980 157 p refs
(Contract NAS3-18546)
(NASA-CR-159838; MTI-80TR29) Avail: NTIS HC A08/MF A01 CSCL 20K

An elastomer damper was designed, tested, and compared with the performance of a hydraulic damper for a power transmission shaft. The six button Viton-70 damper was designed so that the elastomer damper or the hydraulic damper could be activated without upsetting the imbalance condition of the assembly. This permitted a direct comparison of damper effectiveness. The elastomer damper consistently performed better than the hydraulic mount and permitted stable operation of the power transmission shaft to speeds higher than obtained with the squeeze film damper. Tests were performed on shear specimens of Viton-79, Buna-N, EPDM, and Neoprene to determine performance limitations imposed by strain, temperature, and frequency. Frequencies of between 110 Hz and 1100 Hz were surveyed with imposed strains between 0.0005 and 0.08 at temperatures of 32 C, 66 C, and 80 C. A set of design curves was generated in a unified format for each of the elastomer materials. E.D.K.

N80-22734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR, THREE-DIMENSIONAL FINITE-ELEMENT ANALYSIS OF AIR-COOLED GAS TURBINE BLADES
Albert Kaufman and Raymond E. Gaugler Apr. 1980 22 p refs
(NASA-TP-1669; E-074) Avail: NTIS HC A02/MF A01 CSCL 21E

Cyclic stress-strain states in cooled turbine blades were calculated for a simulated mission of an advanced-technology commercial aircraft engine. The MARC, nonlinear, finite-element computer program was used for the analysis of impingement-cooled airfoils, with and without leading-edge film cooling. Creep was the predominant damage mode (ignoring hot corrosion), particularly around film-cooling holes. Radially angled holes exhibited less creep than holes with axes normal to the surface. Beam-theory analyses of all-impingement-cooled airfoils gave fair agreement with MARC results for initial creep. Author

N80-22735*# Kentron International, Inc., Hampton, Va. Technical Center.
A DESIGN PROCEDURE FOR A TENSION-WIRE STIFFENED TRUSS-COLUMN
William H. Greene Apr. 1980 36 p refs
(Contract NAS1-16000)
(NASA-CR-3273) Avail: NTIS HC A03/MF A01 CSCL 20K

A deployable, tension wire stiffened, truss column configuration was considered for space structure applications. An analytical procedure, developed for design of the truss column and exercised in numerical studies, was based on equivalent beam stiffness coefficients in the classical analysis for an initially imperfect beam column. Failure constraints were formulated to be used in a combined weight/strength and nonlinear mathematical programming automated design procedure to determine the minimum mass column for a particular combination of design load and length. Numerical studies gave the mass characteristics of the truss column for broad ranges of load and length. Comparisons of the truss column with a baseline tubular column used a special structural efficiency parameter for this class of columns. E.D.K.

N80-22736*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
GEOMETRIC MODELING AND ANALYSIS OF LARGE LATTICED SURFACES
Adnan H. Nayfeh and Mohamed S. Hefzy Apr. 1980 65 p refs
(Grant NsG-1185)
(NASA-CR-3156) Avail: NTIS HC A04/MF A01 CSCL 20K

The application of geometrical schemes, similar to geodesic domes, to large spherical antenna reflectors was investigated. The shape and size of flat segmented latticed surfaces which approximate general shells of revolution, and in particular spherical

and paraboloidal reflective surfaces, were determined. The extensive mathematical and computational geometric analyses of the reflector resulted in the development of a general purpose computer program capable of generating the complete design parameters of the dish. The program also includes a graphical self contained subroutine for graphic display of the required design. E.D.K.

N80-22737*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATION OF TWO DESIGN METHODS FOR ACTIVE FLUTTER SUPPRESSION AND WIND-TUNNEL TEST RESULTS

Jerry R. Newsom, Irving Abel, and H. J. Dunn May 1980 84 p refs

(NASA-TP-1653; L-13177) Avail: NTIS HC A05/MF A01 CSCL 20L

The synthesis, implementation, and wind tunnel test of two flutter suppression control laws for an aeroelastic model equipped with a trailing edge control surface are presented. One control law is based on the aerodynamic energy method, and the other is based on results of optimal control theory. Analytical methods used to design the control laws and evaluate their performance are described. At Mach 0.6, 0.8, and 0.9, increases in flutter dynamic pressure were obtained but the full 44 percent increase was not achieved. However at Mach 0.95, the 44 percent increase was achieved with both control laws. Experimental results indicate that the performance of the systems is not so effective as that predicted by analysis, and that wind tunnel turbulence plays an important role in both control law synthesis and demonstration of system performance. E.D.K.

N80-22738# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.

EFFECTS OF SHEAR DEFORMATION AND ANISOTROPY ON THE THERMAL BENDING OF LAYERED COMPOSITE PLATES

J. N. Reddy and Y. S. Hsu Dec. 1979 28 p refs

(Contract N00014-78-C-0647; NR Proj. 064-609)

(AD-A080534; OU-AMNE-79-20; TR-9) Avail: NTIS HC A03/MF A01 CSCL 20/11

A finite-element formulation of equations governing layered anisotropic composite plates subjected to thermal and mechanical loadings is presented. An exact closed-form solution is also presented for simply supported rectangular cross-ply laminated plates under sinusoidal loading to validate the finite element solutions obtained. The finite element results are in good agreement with the closed-form solutions and with the results of others. GRA

N80-22739# Rutgers - The State Univ., Piscataway, N. J. Dept. of Mechanics and Materials Science.

A FINITE ELEMENT SOLUTION OF THE COUPLED DYNAMICAL THERMOELASTICITY EQUATIONS IN A SLAB Final Report, 10 Jan. - 9 Oct. 1979

Y. Chen, H. Ghoneim, and J. Davis (Army Armament Res. and Develop. Command) 9 Jan. 1980 23 p refs

(Grant DAAG29-79-G-0052)

(AD-A080712; ARO-16410.1-R-E) Avail: NTIS HC A02/MF A01 CSCL 20/13

A finite-element methodology has been presented to solve the one dimensional couple dynamical thermoelasticity. The spatial variable is discretized by the Galerkin scheme and the central difference scheme. The time variable is discretized by the Galerkin and the backward difference scheme. It was found that the two spatial discretization approaches give close comparison in accuracy when used in conjunction with the backward difference in time. To simulate the wave-like behavior in micro-time scale becomes expensive but there is no technical difficulty. To simulate the macro-time phenomena, the micro-time behavior would disappear. Two test problems are presented to show the micro- and the macro-time behaviors of the thermoelastic slab. The responses to a realistic set of pressure and temperature pulse inputs simulating the interior ballistic type of action are also presented. GRA

N80-22740# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.

ANALYSES OF CROSS-PLY RECTANGULAR PLATES OF BIMODULUS COMPOSITE MATERIAL M.S. Thesis

V. Sudhakar Reddy and Charles W. Bert Jan. 1980 112 p refs

(Contract N00014-78-C-0647; NR Proj. 064-609)

(AD-A080483; OU-AMNE-80-1; TR-10) Avail: NTIS HC A06/MF A01 CSCL 20/11

A differential-equation formulation is presented for the equations governing the small-deflection elastic behavior of thick plates laminated of anisotropic bimodulus materials (which have different elastic stiffnesses depending upon the sign of the fiber-direction strains). This study is concerned with the problems of bending due to pressure loading, free vibrations, and thermal expansion of thick plates having finite transverse shear moduli. Large static deflections of thin plates are also analyzed by an approximate technique. A simple scheme is used for determining explicitly the location of the neutral surface which is defined on the basis of fiber-direction strain. This provides a basis for rational design of such plates. Exact closed-form solutions are presented for freely supported rectangular plates subjected to a sinusoidally distributed normal pressure. Based on experimentally measured bimodulus properties, some numerical computations are carried out. Good agreement is obtained when compared with numerical results existing in the literature for special cases. The results presented here can be used to validate finite-element codes being developed for analysis of thick plates laminated of bimodulus material. GRA

N80-22741# Pennsylvania State Univ., University Park. Applied Research Lab.

VIBRATION ISOLATION ON RIGID AND NONRIGID FOUNDATIONS Final Report

J. C. Snowdon 23 Jul. 1979 120 p refs

(Contract N00024-79-C-6043)

(AD-A074737; ARL/PSU-TH-79-137) Avail: NTIS HC A06/MF A01 CSCL 20/11

The problem of isolating machinery vibration from rigid and nonrigid substructures is analyzed in detail. The nonrigid substructures are modeled by clamped-clamped beams and by simply supported plates with small internal damping of the solid type. Both simple and compound mounting systems are analyzed. The advantages that result from the use of the compound mounting system are clearly apparent. The loss in isolation is described that results when nonrigid flanges or feet support the simply mounted item or the intermediate mass of the compound mounting system. The use is also analyzed of dynamic vibration absorbers or lumped masses to load the beamlike and platelike substructures at each mount location. The item of machinery is supported either by eight or by four antivibration mounts that have small damping of the solid type. It is shown how the number of beam and plate resonances that are excited can be reduced by judicious placement of the antivibration mountings. GRA

N80-22742# State Univ. of New York at Buffalo. Dept. of Engineering Science, Aerospace Engineering and Nuclear Engineering.

A GENERAL UNIQUENESS THEOREM IN NONLINEAR VISCOELASTICITY WITH APPLICATION TO TEMPERATURE AND IRRADIATION INDUCED CREEP PROBLEMS Summary Report

George A. Becus and F. A. Carelli Aug. 1979 23 p refs

(Contract N00014-75-C-0302)

(AD-A075738; Rept-112) Avail: NTIS HC A02/MF A01 CSCL 20/11

A general uniqueness theorem is first derived for a general constitutive relation in the form of a nonlinear memory integral with aging included. Uniqueness is proved for the solution to the dynamic mixed boundary value problem with small deformations. The general theorem is then specialized to a constitutive equation of the isotropic power law type governing thermoirradiation induced creep. GRA

N80-22743# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

STRUCTURAL INELASTICITY 25: COMPUTATION OF NON-UNIQUE SOLUTIONS OF ELASTIC-PLASTIC TRUSSES

Davić L. White and Philip G. Hodge, Jr. Nov. 1979 12 p refs

(Contract N00014-75-C-0177; NR Proj. 064-429)
(AD-A080354; AEM-H1-25) Avail: NTIS HC A02/MF A01 CSCL 13/13

It has recently been shown that the solution to certain well-defined boundary value problems for elastic/perfectly-plastic structures is non-unique. The present paper is concerned with the ability of finite-element computer programs to handle such solutions. Some problems arising from non-uniqueness are documented and techniques for circumventing those problems are evaluated by exploring the response of the program Non SAP to a variety of trusses with non-unique solutions. GRA

N80-22744# Naval Research Lab., Washington, D. C. Thermo-structural Materials Branch.

NOTCH DUCTILITY DEGRADATION OF LOW ALLOY STEELS WITH LOW TO INTERMEDIATE NEUTRON FLUENCE EXPLOSURES Interim Report

J. R. Hawthorne 14 Jan. 1980 31 p refs
(AD-A081003; AD-E000365; NRL-8357; NUREG-CR-1053) Avail: NTIS HC A03/MF A01 CSCL 18/10

The extent and trend of Charpy-V (C sub v) notch ductility changes in reactor vessel materials with fluences of 1 X 10 (to the 18th power) to 10 X 10 (to the 18th power) n/square cm greater than 1 MeV were investigated with several thick section steel plates and submerged arc weld deposits irradiated at 288C (550 F). The materials were fully representative of reactor vessels now in service and had copper contents ranging from 0.10 to 0.40% and phosphorus contents ranging from 0.008 to 0.020%. Material irradiations were performed in a 2 MW pool reactor. The steels with high radiation sensitivity indicated an onset of notch ductility change at fluences of approximately 1.5 x 10 (to the 18th power) n/square cm by an elevation in the ductile-to-brittle transition temperature. Reductions in upper shelf were not observed at this fluence level but were in the range of 0 to 15% at approximately 4 x 10 (to the 18th power) n/square cm and between 15 to 44% at approximately 8 x 10 (to the 18th power) n/square cm. The data trend suggests a power law relationship of upper shelf reduction to fluence at low-to-intermediate fluences. The C sub v transition temperature elevation and upper shelf reduction with irradiation are compared to embrittlement projections by U.S. Nuclear Regulatory Commission Guide 1.99. A limited experimental comparison of radiation effects to dynamic fracture toughness and notch ductility is also presented. GRA

N80-22745# Rensselaer Polytechnic Inst., Troy, N. Y.

MODEL OF TORSIONAL BEHAVIOR IN THERMOMECHANICAL BENDING M.S. Thesis

Jeanne R. Beesley Apr. 1979 51 p refs
(Contract EM-78-S-02-4610)
(COO-4610-T1) Avail: NTIS HC A04/MF A01

An effort was made to model the response of high voltage transmission cables to the torsional loads which occur in the in situ condition of the cable buried in a pipe. Tests were run on a torsion machine in the laboratory which was able to accommodate a reversal of load. The behavior of the cable was studied as it went through cycles of being twisted in opposite directions alternately. Strain in the tape was measured, as were torque and angle. Mathematical models were derived to determine the torsional stiffness of the cable and the distribution of radial stress in the cable insulation. An attempt was made to compare these models to the test results. The torsional stiffness model compared favorably; however, the results for stress could not be analyzed due to the fact that the material constants which were needed could not be obtained. When these constants become available, the mathematical model will undergo further analyzation to determine its feasibility. DOE

N80-22746# California Univ., Livermore. Lawrence Livermore Lab.

FINITE-ELEMENT CALCULATION OF A HOPKINSON BAR TEST

M. Zaslawsky, C. Tatro, and T. Freeman 17 Oct. 1979 21 p refs Presented at 4th Intern. Congr. on Exptl. Mech., Boston, 25 May 1979
(Contract W-7405-eng-48)
(UCRL-83484; CONF-7905126-1) Avail: NTIS HC A02/MF A01

A finite element analysis of a Hopkinson bar test provided additional insight into wave propagation. In the test, a notched tensile specimen, together with the input and output bars, was subjected to a pressure pulse. In the calculations, this input pulse was duplicated and various material properties were used to describe the test specimens. The output pulses obtained from the analysis and the experiment were compared; the surface deformations recorded by a high-speed camera on the experiment were also compared to computationally obtained surface deformations. The analysis independently confirms the Bridgman stress distribution across the notch. DOE

N80-22747# Oak Ridge National Lab., Tenn.

FINITE ELEMENT MODEL FOR NONLINEAR SHELLS OF REVOLUTION

W. A. Cook Nov. 1979 54 p refs
(Contract W-7405-eng-36)
(LA-8138-MS) Avail: NTIS HC A04/MF A01

A finite element model for symmetrically loaded shells of revolution is described. The nonlinear geometric effects are accounted for by incrementing loads and iterating for equilibrium. The iteration process also allows for nonlinear materials. The shell model accounts for large strains, large rotations, and shear deformation. Three example problems demonstrate the versatility and accuracy of this model. An axially loaded cylinder and an internally pressurized spherical shell have large membrane strains, whereas a cylinder that deforms into a spherical shape has large rotations. DOE

N80-22748# Military Vehicles and Engineering Establishment, Christchurch (England). Armour and Materials Branch.

FRACTURE TOUGHNESS AND MICROSTRUCTURE OF A THICK Al-Zn-Mg EXTRUSION

I. G. Crouch Dec. 1978 30 p refs
(MVEE-78507; BR69362) Avail: NTIS HC A03/MF A01

Mechanical properties including fracture toughness characteristics were determined for Al-4.5 Zn-2.5 Mg rectangular extrusions. Tensile properties found to vary significantly with orientation, location within the section, and position along the length of the extrusions are discussed. These values have been correlated with the variable grain structure observed within the material. Using currently available fracture mechanics solutions for lug components, an estimation of a critical stress intensity is compared with the experimentally determined fracture toughness valves. Critical crack lengths are also given. Author (ESA)

N80-22749# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

FATIGUE CRACK PROPAGATION IN ALUMINUM ALLOY SHEET MATERIALS UNDER MANEUVER SPECTRUM AND CONSTANT AMPLITUDE LOADING

R. J. H. Wanhill Jun. 1978 25 p refs Submitted for publication Sponsored in part by Royal Netherlands Air Force Directorate of Material
(NLR-MP-78025-U) Avail: NTIS HC A02/MF A01

Aluminum alloy sheets were compared for fatigue crack propagation resistance under maneuver conditions and constant amplitude loading. Results of stress levels, crack growth rate, delta k value, and fracture toughness for each alloy are presented. Author (ESA)

N80-22750# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.

ON THE J-INTEGRAL AND OTHER EVALUATION METHODS OF ELASTIC-PLASTIC FRACTURE MECHANICS AS WELL AS ON THE LIMITS OF APPLICATION OF LINEAR-ELASTIC FRACTURE MECHANICS

Hans Peter Keller Jan. 1979 169 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-617)
(DFVLR-FB-79-03) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 24.90

The critical stress intensity factor was determined for three steels and two aluminum alloys using linear elastic fracture mechanics and methods of elastic-plastic fracture mechanics. The use of the methods to determine the critical stress intensity

factor for ductile crack extension on small specimens is discussed. Author (ESA)

N80-22751# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
DEVELOPMENT OF COMPARABLE TRIANGULAR SHELL FINITE ELEMENTS
Klaus Rohwer Apr. 1979 52 p refs
(DFVLR-FB-79-25) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 15.20

The development of ten triangular shell finite elements is described. With these elements it is possible to judge the efficiency of the discrete Kirchhoff method, the reduced integration scheme, and the reduced approximation procedure. The influence of the element curvature as well as the difference in power between a linear and a quadratic approximation are studied. Author (ESA)

N80-22752# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ON THE ASYMPTOTIC THEORY OF PLATES
Geert Zimmermann Jul. 1979 23 p refs
(MPIS-12/1979; ISSN-0436-1199) Avail: NTIS HC A02/MF A01; Fachinformationszentrum Karlsruhe, West Germany DM 6.70

A mathematical formalism is developed which allows the elastic properties of plates to be described in three dimensions. The formalism makes use of an expansion in terms of a thickness parameter in order to arrive at approximate two dimensional plate equations. The existence of a format solution is discussed and confirmed by using Fourier transformations. Author (ESA)

N80-22753# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THE INFLUENCE OF BENDING-TORSIONAL COUPLING ON THE BUCKLING LOAD OF GENERAL ORTHOTROPIC, MIDPLANE SYMMETRIC AND ELASTIC PLATES
J. F. M. Wiggenraad 1977 75 p refs
(Contract NIVR-1808)
(NLR-TR-77126-U) Avail: NTIS HC A04/MF A01

The influence of bending-torsional coupling on the buckling load of general orthotropic, midplane symmetric and elastic plates was studied. This effect was analyzed for the case of infinitely long plate strips, resulting in approximate analytical solutions, which can be presented graphically for the entire range of the elastic constants. These solutions were obtained with the approximate method as applied by Thielemann. The results were compared with results for finite length panels as derived with the finite element method. The conclusion is drawn that buckling loads for plates with aspect ratio over 2 or 3, which demonstrate the bending-torsional coupling effect, can be estimated fairly well from the results for the infinitely long plate strip. Author (ESA)

42 GEOSCIENCES (GENERAL)

N80-22754# Institute of Ecology, Indianapolis, Ind.
ROLE OF ORGANIC SOILS IN THE WORLD CARBON CYCLE: PROBLEM DEFINITION AND RESEARCH NEEDS Summary Report
T. V. Armentano, ed. 1979 37 p refs Presented at the Workshop on Organic Soils, Indianapolis, 7-8 May 1979
(Contract DE-AC02-79EV-10040)
(DOE/ET-10040-1(Summ)) Avail: NTIS HC A03/MF A01

Findings and recommendations of the workshop on organic soils are summarized. The major finding of the workshop is that organic soils are important in the overall carbon budget. Histosols and gleysols, the major organic soil deposits of the world, normally sequester organic carbon fixed by plants. They may now be releasing enough carbon to account for nearly 10 percent of the annual rise in atmospheric content of CO2. Several strategies for peatland management are discussed, including creation, preservation, functional designation, and use of wetlands for agriculture and energy supply. DOE

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N80-22755*# Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab.
ESTIMATION OF EFFECTIVE HYDROLOGIC PROPERTIES OF SOILS FROM OBSERVATIONS OF VEGETATION DENSITY
Tobin E. Tellers and Peter S. Eagleson Mar. 1980 126 p refs
(Grant NsG-5306)
(NASA-CR-163002; RBO-7; OSP-87326; Rept-254) Avail: NTIS HC A07/MF A01 CSCL 08M

A one-dimensional model of the annual water balance is reviewed. Improvements are made in the method of calculating the bare soil component of evaporation, and in the way surface retention is handled. A natural selection hypothesis, which specifies the equilibrium vegetation density for a given, water limited, climate soil system, is verified through comparisons with observed data. Comparison of CDF's of annual basin yield derived using these soil properties with observed CDF's provides verification of the soil-selection procedure. This method of parameterization of the land surface is useful with global circulation models, enabling them to account for both the nonlinearity in the relationship between soil moisture flux and soil moisture concentration, and the variability of soil properties from place to place over the Earth's surface. E.D.K.

N80-22756*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SURVEY OF METHODS FOR SOIL MOISTURE DETERMINATION
T. J. Schmugge, T. J. Jackson (Dept. of Agriculture, Beltsville, Md.), and H. L. McKim (CRREL) Nov. 1979 76 p refs Presented at the Pecora Symp., Sioux Falls, S.D., Jun. 1979 Submitted for publication
(NASA-TM-80658) Avail: NTIS HC A05/MF A01 CSCL 08M

Existing and proposed methods for soil moisture determination are discussed. These include: (1) in situ investigations including gravimetric, nuclear, and electromagnetic techniques; (2) remote sensing approaches that use the reflected solar, thermal infrared, and microwave portions of the electromagnetic spectrum; and (3) soil physics models that track the behavior of water in the soil in response to meteorological inputs (precipitation) and demands (evapotranspiration). The capacities of these approaches to satisfy various user needs for soil moisture information vary from application to application, but a conceptual scheme for merging these approaches into integrated systems to provide soil moisture information is proposed that has the potential for meeting various application requirements. A.R.H.

N80-22757# National Environmental Satellite Center, Washington, D. C.
FUTURE UNITED STATES SATELLITE PROGRAMS OF INTEREST TO SNOW SCIENTISTS
Donald R. Wiesnet 1979 7 p
Avail: NTIS HC A02/MF A01

Orbital parameters and sensor characteristics are described for the Heat Capacity Mapping Mission, LANDSAT C, Seasat A, Nimbus G, and the Tiros N satellites. Implications for snow studies using the new and improved sensors are discussed. A.R.H.

N80-22758*# Computer Sciences Corp., Wallops Island, Va.
DETERMINING SEA-ICE BOUNDARIES AND ICE ROUGHNESS USING GEOS-3 ALTIMETER DATA
R. E. Dwyer and R. H. Godin (NOAA, Washington, D. C.) Wallops Island, Va. NASA Wallops Flight Center. Mar. 1980 49 p refs
(NASA-CR-156862) Avail: NTIS HC A03/MF A01 CSCL 08L

The GEOS-3 satellite and radar altimeter instrumentation are described, detailing the ice boundary discrimination technique

utilized and presenting an analyses of the GEOS-3 data with respect to satellite visual and IR imagery. A brief description of the GEOS-3 real time data system is also given. E.D.K.

N80-22759*# National Aeronautics and Space Administration, Washington, D. C.

PROGRAM FOR INTEGRATING MULTIZONAL PHOTOGRAPHS OF THE EARTH, TAKEN BY MKF-6 CAMERA, IN A COMPUTER

A. V. Agapov and S. T. Mosin Jan. 1980 14 p Transl. into ENGLISH of "Programma Sovmeshcheniya v EVM Mnogozonalnykh Fotosnimkov Zemli, Poluchennykh Fotokamerami MKF-6", Rept. Pr-323 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1977 p 1-13 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Acad. of Sci. USSR, Kolosov

(Contract NASw-3199)

(NASA-TM-75701; Pr-323) Avail: NTIS HC A02/MF A01 CSCL 14E

An algorithm and program are described, for integrating up to 6 simultaneously exposed photographs in different spectral ranges of the surface of the Earth, taken by MKF-6 cameras aboard Soyuz-22. Three of the reference marks are identified on 1 photograph and then are used to integrate the other photographs with the first. The program was compiled for the ES-1040 computer, as a standard subprogram in a system for computer processing of data of study of the Earth from space. Author

N80-22760*# National Aeronautics and Space Administration, Washington, D. C.

THE SOPHIA-ANTIPOLIS CONFERENCE: GENERAL PRESENTATION AND BASIC DOCUMENTS

Mar. 1980 50 p Transl. into ENGLISH of conf. paper from CNES, Operation Pilote Interministerielle de Teledetection, Paris Conf. held at Paris, Feb. 1980 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76132) Avail: NTIS HC A03/MF A01 CSCL 05A

The procedures and techniques used in NASA's aerospace technology transfer program are reviewed for consideration in establishing priorities and bases for joint action by technicians and users of remotely sensed data in France. Particular emphasis is given to remote sensing in agriculture, forestry, water resources, environment management, and urban research. A.R.H.

N80-22761# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.

A COLOR RASTER SCANNING SYSTEM FOR DIGITIZING CARTOGRAPHIC DATA Final Technical Report, May 1976 - Jun. 1979

Douglas Modeen, Stephen Niemczyk, Frank Sundermeyer, and Richard Hubbard Griffiss AFB, N.Y. RADC Nov. 1979 114 p refs

(Contract F30602-76-C-0205; AF Proj. 4303)

(AD-A080469; HSER-7673; RADC-TR-79-286) Avail: NTIS HC A06/MF A01 CSCL 08/2

The final technical report on the color raster scanner system described the principal system requirements, and the technical considerations leading to the definition of the design approaches employed. The resulting system is composed of major functional elements in hardware, in software, and in the operator support interfaces. This latter area is of high importance in applying the scanner capabilities to obtain satisfactory results in the use of the scanned cartographic data. The report contains a functional description of the color raster scanner system in all its subdivisions, and includes results of test and evaluation as obtained. The major units of the system are the drum scanner unit, the data preprocessor, the control microprocessor with its I/O control and display hardware, the model 8/32 processor system, and the applications software which supports, controls, and integrates system operations. The hardware and software functional descriptions follow the flow of data from photodetection to its recording in digital form on magnetic tape. The software is described in its diverse applications of operator support, on-line processing of data as scanned and off-line processing of output scanned data to requirements which entail more extensive file manipulation. GRA

N80-22762# Army Engineer Topographic Labs., Fort Belvoir, Va.

PROTOTYPE IMAGE SPECTRUM ANALYZER (PISA) FOR CARTOGRAPHIC FEATURE EXTRACTION

Pi-Fuay Chen, Frederick W. Rohde, and William W. Seemuller Oct. 1979 69 p

(DA Proj. 4A1-61102-B-52C)

(AD-A080729; ETL-0204) Avail: NTIS HC A04/MF A01

An electro-optical system for obtaining two-dimensional Walsh transforms of cartographic images was developed. The system uses a plasma discharge device to generate visible two-dimensional Walsh function pattern masks. The cartographic imagery is placed in contact with the plasma tube, and the product of the mask and image is integrated with a single photodetector. The system is capable of producing 512 by 512 (262, 144), two-dimensional Walsh functions, and the same number of associated Walsh transform coefficients in about 14 seconds. The quantitative measurement and display of the relative magnitude of the first block of Walsh transforms (64 x 64) was facilitated with a system minicomputer and a CRT display. A set of selected cartographic images and targets were used to evaluate the system. It was discovered that most of the significant transform information appeared in the lower order Walsh transform coefficients, and further that each Walsh transform pattern is unique in itself and can be distinguished from the others for a limited set of well defined inputs. The dynamic range, the temporal response, and the symmetry of responses of the Prototype Image Spectrum Analyzer (PISA) were found to be relatively poor. GRA

N80-22763# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.

ANALYSIS OF LASER RANGING AND VLBI OBSERVATIONS FOR GEODETIC PURPOSES Final Report, 1 Oct. 1977 - 31 Mar. 1979

I. I. Shapiro, C. C. Counselman, and T. A. Herring Hanscom AFB, Mass. AFGL 10 Aug. 1979 18 p refs Sponsored in part by Defense Mapping Agency.

(Contract F19628-77-C-0271; AF Proj. 3204)

(AD-A077294; AFGL-TR-79-0195) Avail: NTIS HC A02/MF A01 CSCL 08/5

From three Very Long Baseline Interferometry (VLBI) experiments carried out in 1977 and 1978, the distances between the antenna at Onsala (Sweden) and radio telescopes at Haystack (Massachusetts), Green Bank (West Virginia) and Owens Valley (California) have been determined with formal standard errors as small as a few centimeters and repeatability generally within the 99% confidence interval of the root-sum-squares of these standard errors. Overall it appears that subdecimeter precision has been achieved in these estimates of baseline lengths. Using these data, we have also determined changes in UT1 and in the x and y components of polar motion. GRA

N80-22764# Oak Ridge National Lab., Tenn. Energy Div.

WATER AVAILABILITY FOR ENERGY IN 1985 AND 1990

Jerome E. Dobson and Alf D. Shepherd Oct. 1979 108 p refs

(Contract W-7405-eng-26)

(ORNL/TN-6777) Avail: NTIS HC A06/MF A01

The effects of the National Energy Plan (NEP) on water for energy demands in 1985 and 1990 are examined. Estimates of total consumption are compared with estimates of critical monthly surface-water supply, derived from streamflow and reservoir use data, in each WRC Aggregated Subarea in the conterminous United States. It is concluded that water availability will not inhibit implementation of the NEP because its conservation goals actually retard the growth of water for energy demands in most basins compared with what might be expected without the NEP. However, the results of this assessment and previous corroborative water for energy analyses show that, with or without the NEP, energy development will cause additional water availability problems on already stressed streams and reservoirs throughout much of the western United States, southern Florida, the Ohio River Basin, and the highly urbanized areas of the Eastern Seaboard. DOE

N80-22765# Rockwell International Corp., Richland, Wash. Basalt Hydrology Unit.

SURFACE HYDROLOGIC INVESTIGATIONS OF THE COLUMBIA PLATEAU REGION, WASHINGTON
L. S. Leonhart Jul. 1979 242 p refs
(Contract EY-77-C-06-1030)
(RHO-BWI-ST-6) Avail: NTIS HC A11/MF A01

The Washington State portion of the Columbia Plateau is divided into six hydrologic sub-basins on the basis of the principal surface drainage systems present, structural and topographic relationships, and political and other considerations. Baseline descriptions of the surface water systems and resources are presented for the Columbia Plateau with emphasis on the Pasco Sub-basin. A preliminary evaluation of the hydrology budget for each sub-basin is derived. The net exchange between surface and ground-water systems is evaluated and relative estimates of the net ground-water flow into or out of the sub-basin are obtained. An evaluation is made of hydrologic risk factors arising from: tributary flooding in eastern Washington; and major flooding of the Columbia River within the Pasco Sub-basin. Scenarios are presented for credible natural and man-generated catastrophic events. DOE

N80-22766# National Technical Information Service, Springfield, Va.
COMPUTER AIDED MAPPING. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - 1979
Brian Carrigan Feb. 1980 154 p
(PB80-804305) Avail: NTIS HC $30.00/MF $30.00 CSCL 08B

Approximately 147 citations on the application of computer techniques to cartography from the worldwide journal literature are presented. Automatic mapping, geographic data bases, and computerized photomapping are included. GRA

N80-22767# National Technical Information Service, Springfield, Va.
COMPUTER AIDED MAPPING. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - 1979
Brian Carrigan 29 Apr. 1980 181 p
(PB80-804297) Avail: NTIS HC $30.00/MF $30.00 CSCL 08B

Federally-sponsored research on the application of computer techniques to cartography is cited. Automatic mapping, geographic data bases, and computerized photomapping are included. Contains 174 abstracts. GRA

N80-22768# Bureau of Mines, Amarillo, Tex. Helium Operations.
HELIUM IN GROUND WATER AND SOIL GAS IN THE VICINITY OF BUSH DOME RESERVOIR, CLIFFSIDE FIELD, POTTER COUNTY, TEXAS
Philip W. Holland and David E. Emerson 1979 27 p refs
(PB80-125305; BM-IC-8807) Avail: NTIS HC A03/MF A01 CSCL 08D

Three independent reconnaissance geochemical surveys were conducted in the vicinity of the Bush Dome Reservoir in the Cliffside field near Amarillo to determine the helium content of area ground waters, area soil gases and ground waters, and of soil gases collected on a grid sampling pattern in the Cliffside field area. Results of the surveys were positive in that helium-in-water and helium-in-soil-gas anomalies were detected in portions of the Cliffside field area. GRA

N80-22769# State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse. School of Landscape Architecture.
LANDSCAPE VISIBILITY MAPPING: THEORY AND PRACTICE
John P. Felleman 1979 125 p refs Sponsored by NOAA
(PB80-130719; NOAA-79120704) Avail: NTIS HC A06/MF A01 CSCL 08B

The geographic extent of visibility is considered. A coherent conceptual construct of landscape visibility mapping is developed and the alternative methods of data organization are systematically articulated. A working definition of a comprehensive visibility model is presented and data assembly for the elements of the visibility model are discussed. Line of sight processing methods for stationary position and for moving observers are examined as well as visibility outputs, plan views, and perspectives. GRA

N80-22770# TRW, Inc., McLean, Va. Energy Systems Group.
OIL SHALE DATA BOOK
Jun. 1979 410 p
(Contract DE-AC01-78RA-32012)
(PB80-125636) Avail: NTIS HC A18/MF A01 CSCL 08I

A ready reference for evaluation of appropriate shale oil recovery technologies and associated processes is presented. Technologies addressed are: mining and crushing; ore haulage; beneficiation of lean ore; surface and in situ retorting; upgrading of shale oil and gas clean-up; shale disposal and waste water treatment; pipeline transportation. GRA

N80-22771# Resources for the Future, Inc., Washington, D. C.
MAJOR MINERAL SUPPLY PROBLEMS: A STUDY THE NONFUEL MINERALS POLICY REVIEW Final Report
Leonard L. Fischman, Jacob J. Kaplan, John J. Schanz, Jr., John E. Tilton, and John E. Jankowski, Jr. Sep. 1979 1108 p
(Contract ST-8A57)
(PB80-117674) Avail: NTIS HC A99/MF A01 CSCL 08I

From consumption and supply potential in countries, the study derived world demand, supply, and price projections to the year 2000 were derived for each of the commodity forms, through refined metal, in which each of the seven minerals is importantly consumed. Prior projections of world minerals consumption have been generally too high owing to over-estimation of long-term economic growth. Supply tightness seems to be in prospect for ferromanganese and ferrochromium, refractory chromite, and aluminum in its three principal forms of ore, alumina, and refined metal. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-22772 Delaware Univ., Newark.
DYNAMICS AND CONTROL OF LARGE HORIZONTAL-AXIS AXISYMMETRIC WIND TURBINES Ph.D. Thesis
Murray Steven Hirschbein 1979 471 p
Avail: Univ. Microfilms Order No. 8006484

The dynamic response of an entire rotor-tower wind turbine system was examined to provide insight into the nature and solution of dynamic problems that may be encountered during the operation of large horizontal-axis, axisymmetric wind turbines. The numerical results are presented for a 3 bladed, 300 ft. diameter wind turbine driving either constant or variable speed electrical power generating equipment. Three areas of wind turbine research were studied: steady state loading, stability and gust response. Blade pitch control was used effectively to reduce the steady fatigue loading from gravity, side winds, wind shear, and to attenuate gust loading. An integral part of this analysis was the development of an algorithmic approach to kinematics of wind turbine dynamics which allowed numerically exact equations of motion to be derived by a digital computer. Dissert. Abstr.

N80-22773 Columbia Univ., New York.
SILICON SCHOTTKY BARRIER SOLAR CELLS Ph.D. Thesis
Paul Panayotatos 1979 127 p
Avail: Univ. Microfilms Order No. 8009346

The expression for the recombination rate as a function of voltage, of illumination level, and of position in the space charge region of the Schottky barrier solar cells was derived. The recombination current density was derived by numerical integration

of the above expression. Information on the uncovering of deep recombination centers by the hole quasi Fermi level under increasing illumination is provided. It is found that the principal effect of recombination under illumination is the reduction of the photocurrent. Dissert. Abstr.

N80-22774*# Florida Solar Energy Center, Cape Canaveral.
SOLAR HEATING AND COOLING DEMONSTRATION PROJECT AT THE FLORIDA SOLAR ENERGY CENTER Final Report
Feb. 1980 175 p refs Sponsored in part by NASA
(Contract EG-77-A-01-4074)
(NASA-CR-161413) Avail: NTIS HC A08/MF A01 CSCL 10A

The retrofitted solar heating and cooling system installed at the Florida Solar Energy Center is described. The system was designed to supply approximately 70 percent of the annual cooling and 100 percent of the heating load. The project provides unique high temperature, nonimaging, nontracking, evacuated tube collectors. The design of the system was kept simple and employs five hydronic loops. They are energy collection, chilled water production, space cooling, space heating and energy rejection. Information is provided on the system's acceptance test results operation, controls, hardware and installation, including detailed drawings. R.E.S.

N80-22775*# Spire Corp., Bedford, Mass.
STUDY PROGRAM TO IMPROVE THE OPEN-CIRCUIT VOLTAGE OF LOW RESISTIVITY SINGLE CRYSTAL SILICON SOLAR CELLS
J. A. Minnucci and K. W. Matthei 7 Feb. 1980 119 p refs
(Contract NAS3-20823)
(NASA-CR-159833; FR-10056) Avail: NTIS HC A06/MF A01 CSCL 10A

The results of a 14 month program to improve the open circuit voltage of low resistivity silicon solar cells are described. The approach was based on ion implantation in 0.1- to 10.0-ohm-cm float-zone silicon. As a result of the contract effort, open circuit voltages as high as 645 mV (AMO 25 C) were attained by high dose phosphorus implantation followed by furnace annealing and simultaneous SiO2 growth. One key element was to investigate the effects of bandgap narrowing caused by high doping concentrations in the junction layer. Considerable effort was applied to optimization of implant parameters, selection of furnace annealing techniques, and utilization of pulsed electron beam annealing to minimize thermal process-induced defects in the completed solar cells. F.O.S.

N80-22776*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LITERATURE SURVEY OF PROPERTIES OF SYNFUELS DERIVED FROM COAL Interim Report
Thaine W. Reynolds, Richard W. Niedzwiecki, and John S. Clark Feb. 1980 162 p refs
(Contract EF-77-A-01-2593)
(NASA-TM-79243; DOE/NASA/2593-79/8; E-150) Avail: NTIS HC A08/MF A01 CSCL 21D

A literature survey of the properties of synfuels for ground-based gas turbine applications is presented. Four major concepts for converting coal into liquid fuels are described: solvent extraction, catalytic liquefaction, pyrolysis, and indirect liquefaction. Data on full range syncrudes, various distillate cuts, and upgraded products are presented for fuels derived from various processes, including H-coal, synthoil, solvent-refined coal, donor solvent, zinc chloride hydrocracking, co-steam, and flash pyrolysis. Some typical ranges of data for coal-derived low Btu gases are also presented. R.E.S.

N80-22777*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED SCREENING OF ELECTRODE COUPLES
J. Giner and K. Cahill Feb. 1980 56 p refs
(Contract NAS3-20794; EC-77-A-31-1002)
(NASA-CR-159738; DOE/NASA/0794-80/1) Avail: NTIS HC A04/MF A01 CSCL 10B

The chromium (Cr(3+)/Cr(2+)) redox couple (electrolyte and electrode) was investigated to determine its suitability as negative electrode for the iron (Fe(3+)/Fe(2+))-chromium (Cr(3+)/Cr(2+)) redox flow battery. Literature search and laboratory investigation established that the solubility and stability of aqueous acidic solutions of chromium(3) chloride and chromium(2) chloride are sufficient for redox battery application. Four categories of electrode materials were tested; namely, metals and metalloid materials (elements and compounds), alloys, plated materials, and Teflon-bonded materials. In all, the relative performance of 26 candidate electrode materials was evaluated on the basis of slow scan rate linear sweep voltammetry in stirred solution. No single material tested gave both acceptable anodic an acceptable cathodic performance. However, the identification of lead as a good cathodic electrocatalyst and gold as a good anodic electrocatalyst led to the invention of the lead/gold combination electrocatalyst. This type of catalyst can be fabricated in several ways and appears to offer the advantages of each metal without the disadvantages associated with their use as single materials. This lead/gold electrocatalyst was tested by NASA-Lewis Research Center in complete, flowing, redox batteries comprising a stack of several cells. A large improvement in the battery's coulombic and energy efficiency was observed. F.O.S.

N80-22778*# AiResearch Mfg. Co., Phoenix, Ariz.
CONCEPT DEFINITION STUDY OF SMALL BRAYTON CYCLE ENGINES FOR DISPERSED SOLAR ELECTRIC POWER SYSTEMS Final Report, Sep. 1978 - Jun. 1979
Lyle D. Six, Thomas L. Ashe, Frank X. Dobler, and Ron T. Elkins Jan. 1980 135 p refs
(Contracts DEN3-69; EX-76-A-29-1060)
(NASA-CR-159592; DOE/NASA/0069-79/1; AiResearch-31-3328) Avail: NTIS HC A07/MF A01 CSCL 10B

Three first-generation Brayton cycle engine types were studied for solar application: a near-term open cycle (configuration A), a near-term closed cycle (configuration B), and a longer-term open cycle (configuration C). A parametric performance analysis was carried out to select engine designs for the three configurations. The interface requirements for the Brayton cycle engine/generator and solar receivers were determined. A technology assessment was then carried out to define production costs, durability, and growth potential for the selected engine types. R.E.S.

N80-22779*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE (SPS) SOLID-STATE ANTENNA POWER COMBINER Final Report, 13 Jun. 1979 - 31 Jan. 1980
29 Feb. 1980 108 p ref
(Contract NAS9-15636)
(NASA-CR-160574; D180-25895-1) Avail: NTIS HC A06/MF A01 CSCL 10A

A low loss power-combining microstrip antenna suitable for solid state solar power satellite (SPS) application was developed. A unique approach for performing both the combining and radiating function in a single cavity-type circuit was verified, representing substantial refinements over previous demonstration models in terms of detailed geometry to obtain good matching and adequate bandwidth at the design frequency. The combiner circuit was designed, built, and tested and the overall results support the view that the solid state power-combining antenna approach is a viable candidate for a solid state SPS antenna building block. R.E.S.

N80-22780*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE (SPS) FIBER OPTIC LINK ASSESSMENT Final Report
31 Jan. 1980 102 p refs
(Contract NAS9-15636)
(NASA-CR-160575; D180-25888-1) Avail: NTIS HC A06/MF A01 CSCL 10A

A feasibility demonstration of a 980 MHz fiber optic link for the Solar Power Satellite (SPS) phase reference distribution system was accomplished. A dual fiber-optic link suitable for a phase distribution frequency of 980 MHz was built and tested. The major link components include single mode injection laser diodes, avalanche photodiodes, and multimode high bandwidth fibers. Signal throughput was demonstrated to be stable and of high quality in all cases. For a typical SPS link length of 200 meters, the transmitted phase at 980 MHz varies approximately 2.5 degrees for every deg C of fiber temperature

change. This rate is acceptable because of the link length compensation feature of the phase control design. R.E.S.

N80-22781*# Interactive Resources, Inc., Point Richmond, Calif.
SOLAR PROCESS WATER HEAT FOR THE IRIS IMAGES CUSTOM COLOR PHOTO LAB Final Report
Mar. 1980 126 p Sponsored by NASA. Marshall Space Flight Center.
(Contract EX-76-C-01-2381)
(NASA-CR-161414) Avail: NTIS HC A07/MF A01 CSCL 10B

The solar facility located at a custom photo laboratory in Mill Valley, California is described. It was designed to provide 59 percent of the hot water requirements for developing photographic film and domestic hot water use. The design load is to provide 6 gallons of hot water per minute for 8 hours per working day at 100 F. It has 640 square feet of flat plate collectors and 360 gallons of hot water storage. The auxiliary back up system is a conventional gas-fired water heater. Site and building description, subsystem description, as-built drawings, cost breakdown and analysis, performance analysis, lessons learned, and the operation and maintenance manual are presented. R.E.S.

N80-22782*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISPERSED STORAGE AND GENERATION CASE STUDIES
Khosrow Bahrami, John A. Stallkamp, and Amy Walton 15 Mar. 1980 187 p refs
(Contracts NAS7-100; DE-AI01-79ET-29026)
(NASA-CR-162996; JPL-Pub-79-98) Avail: NTIS HC A09/MF A01 CSCL 10A

Three installations utilizing separate dispersed storage and generation (DSG) technologies were investigated. Each of the systems is described in costs and control. Selected institutional and environmental issues are discussed, including life cycle costs. No unresolved technical, environmental, or institutional problems were encountered in the installations. The wind and solar photovoltaic DSG were installed for test purposes, and appear to be presently uneconomical. However, a number of factors are decreasing the cost of DSG relative to conventional alternatives, and an increased DSG penetration level may be expected in the future. R.E.S.

N80-22783*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HANDBOOK OF SOLAR ENERGY DATA FOR SOUTH-FACING SURFACES IN THE UNITED STATES. VOLUME 1: AN INSOLATION, ARRAY SHADOWING, AND REFLECTOR AUGMENTATION MODEL
Jeff H. Smith 15 Jan. 1980 312 p refs 3 Vol.
(Contract NAS7-100; EX-76-A-31-1012)
(NASA-CR-162998; DOE/JPL-1012-25-Vol-1; JPL-Pub-79-103-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 10A

A quick reference for obtaining estimates of available solar insolation for numerous locations and array angles is presented. A model and a computer program are provided which considered the effects of array shadowing reflector augmentation as design variables. R.C.T.

N80-22784*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HANDBOOK OF SOLAR ENERGY DATA FOR SOUTH-FACING SURFACES IN THE UNITED STATES. VOLUME 2: AVERAGE HOURLY AND TOTAL DAILY INSOLATION DATA FOR 235 LOCALITIES. ALASKA - MONTANA
Jeff H. Smith 15 Jan. 1980 473 p Sponsored by NASA and DOE, Washington, D. C. 3 Vol.
(NASA-CR-162999; DOE/JPL-1012-25-Vol-2; JPL-Pub-79-103-Vol-2) Avail: NTIS HC A20/MF A01 CSCL 10A

Average hourly and daily total insolation estimates for 235 United States locations are presented. Values are presented for a selected number of array tilt angles on a monthly basis. All units are in kilowatt hours per square meter. R.C.T.

N80-22785*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HANDBOOK OF SOLAR ENERGY DATA FOR SOUTH-FACING SURFACES IN THE UNITED STATES. VOLUME 3: AVERAGE HOURLY AND TOTAL DAILY INSOLATION DATA FOR 235 LOCALITIES. NORTH CAROLINA - WYOMING
Jeff H. Smith 15 Jan. 1980 476 p Sponsored by NASA and DOE, Washington, D. C. 3 Vol.
(NASA-CR-163000; DOE/JPL-1012-25-Vol-3; JPL-Pub-79-103-Vol-3) Avail: NTIS HC A21/MF A01 CSCL 10A

The daily and hourly profiles used to compute total insolation data for 235 locations in the United States are presented. R.C.T.

N80-22786*# AeroChem Research Labs., Inc., Princeton, N. J.
DEVELOPMENT OF PROCESSES FOR THE PRODUCTION OF SOLAR GRADE SILICON FROM HALIDES AND ALKALI METALS Quarterly Report, 1 Jan. - 31 Mar. 1980
C. R. Dickson and R. K. Gould Apr. 1980 21 p refs Sponsored by NASA and DOE
(Contract JPL-955491)
(NASA-CR-162871; AeroChem-TN-212; DOE/JPL-955491-80/2; JPL-9950-326; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

High temperature reactions of silicon halides with alkali metals for the production of solar grade silicon in volume at low cost were studied. Experiments were performed to evaluate product separation and collection processes, measure heat release parameters for scaling purposes, determine the effects of reactants and/or products on materials of reactor construction, and make preliminary engineering and economic analyses of a scaled-up process. R.E.S.

N80-22787*# Mechanical Technology, Inc., Latham, N. Y. Stirling Engine Systems Div.
DESIGN STUDY OF A 15 kW FREE-PISTON STIRLING ENGINE-LINEAR ALTERNATOR FOR DISPERSED SOLAR ELECTRIC POWER SYSTEMS Final Report, Sep. 1978 - Aug. 1979
George R. Dochat, H. S. Chen, S. Bhate, and T. Marusak Aug. 1979 189 p refs
(Contracts DEN3-56; EX-76-A-29-1060)
(NASA-CR-159587; DOE/NASA/0056-79/1; MTI-79TR47) Avail: NTIS HC A08/MF A01 CSCL 10B

A conceptual design of a free piston solar Stirling engine-linear alternator which can be designed and developed to meet the requirements of a near-term solar test bed engine with minimum risks was developed. The conceptual design was calculated to have an overall system efficiency of 38% and provide 15kW electric output. The free piston engine design incorporates features such as gas bearings, close clearance seals, and gas springs. This design is hermetically sealed to provide long life, reliability, and maintenance free operation. An implementation assessment study performed indicates that the free piston solar Stirling engine-linear alternator can be manufactured at a reasonable price cost (direct labor plus material) of $2,500 per engine in production quantities of 25,000 units per year. Opportunity for significant reduction of cost was also identified. R.E.S.

N80-22788*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL ENERGY STORAGE: FOURTH ANNUAL REVIEW MEETING
Mar. 1980 650 p refs Meeting held at Tysons Corner, Va., 3-4 Dec. 1979; sponsored by DOE
(NASA-CP-2125; E-428; CONF-791232) Avail: NTIS HC A99/MF A01 CSCL 10C

The development of low cost thermal energy storage technologies is discussed in terms of near term oil savings, solar energy applications, and dispersed energy systems for energy conservation policies. Program definition and assessment and research and technology development are considered along with industrial storage, solar thermal power storage, building heating and cooling, and seasonal thermal storage. A bibliography on seasonal thermal energy storage emphasizing aquifer thermal energy is included. For individual titles, see N80-22789 through N80-22829.

N80-22789*# Pacific Northwest Lab., Richland, Wash.
SEASONAL THERMAL ENERGY STORAGE PROGRAM
James E. Minor *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 25-31 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The Seasonal Thermal Energy Storage (STES) Program designed to demonstrate the storage and retrieval of energy on a seasonal basis using heat or cold available from waste or other sources during a surplus period is described. Factors considered include reduction of peak period demand and electric utility load problems and establishment of favorable economics for district heating and cooling systems for commercialization of the technology. The initial thrust of the STES Program toward utilization of ground water systems (aquifers) for thermal energy storage is emphasized. J.M.S.

N80-22790*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROGRAM DEFINITION AND ASSESSMENT OVERVIEW
Larry H. Gordon *In its* Thermal Energy Storage Mar. 1980 p 38-41 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The implementation of a program level assessment of thermal energy storage technology thrusts for the near and far term to assure overall coherent energy storage program is considered. The identification and definition of potential thermal energy storage applications, definition of technology requirements, and appropriate market sectors are discussed along with the necessary coordination, planning, and preparation associated with program reviews, workshops, multi-year plans and annual operating plans for the major laboratory tasks. J.M.S.

N80-22791*# Department of Energy, Washington, D. C. Energy Storage Systems Div.
SOLAR APPLICATIONS ANALYSIS FOR ENERGY STORAGE
T. Blanchard *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 43-46 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The role of energy storage as it relates to solar energy systems is considered. Storage technologies to support solar energy applications, the status of storage technologies, requirements and specifications for storage technologies, and the adequacy of the current storage research and development program to meet these requirements are among the factors discussed. Emphasis is placed on identification of where the greatest potential exists for energy storage in support of those solar energy systems which could have a significant impact on the U.S. energy mix. J.M.S.

N80-22792*# Midwest Research Inst., Kansas City, Mo.
THERMAL ENERGY STORAGE SYSTEMS USING FLUIDIZED BED HEAT EXCHANGERS
V. Ramanathan, T. E. Weast, and K. P. Ananth *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 47-55 (For primary document see N80-22788 13-44)
(Contract DEN3-96)
Avail: NTIS HC A99/MF A01 CSCL 10B

The viability of using fluidized bed heat exchangers (FBHX) for thermal energy storage (TES) in applications with potential for waste heat recovery was investigated. Of the candidate applications screened, cement plant rotary kilns and steel plant electric arc furnaces were identified, via the chosen selection criteria, as having the best potential for successful use of FBHX/TES system. A computer model of the FBHX/TES systems was developed and the technical feasibility of the two selected applications was verified. Economic and tradeoff evaluations in progress for final optimization of the systems and selection of the most promising system for further concept validation are described. J.M.S.

N80-22793*# General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
THERMAL ENERGY STORAGE AND TRANSPORT
Walter Hausz *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 57-77 refs (For primary document see N80-22788 13-44)
(EPRI Proj. 1199-3)
Avail: NTIS HC A99/MF A01 CSCL 10B

The extraction of thermal energy from large LWR and coal fired plants for long distance transport to industrial and residential/commercial users is analyzed. Transport of thermal energy as high temperature water is shown to be considerably cheaper than transport as steam, hot oil, or molten salt over a wide temperature range. The delivered heat is competitive with user-generated heat from oil, coal, or electrode boilers at distances well over 50 km when the pipeline operates at high capacity factor. Results indicate that thermal energy storage makes meeting of even very low capacity factor heat demands economic and feasible and gives the utility flexibility to meet coincident electricity and heat demands effectively. J.M.S.

N80-22794*# General Electric Co., Schenectady, N. Y.
CONCEPTUAL DESIGN OF THERMAL ENERGY STORAGE SYSTEMS FOR NEAR-TERM ELECTRIC UTILITY APPLICATIONS
Eldon W. Hall *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 79-84 (For primary document see N80-22788 13-44)
(Contract DEN3-12; EPRI Proj. 1082-1)
Avail: NTIS HC A99/MF A01 CSCL 10B

Promising thermal energy storage systems for midterm applications in conventional electric utilities for peaking power generation are evaluated. Conceptual designs of selected thermal energy storage systems integrated with conventional utilities are considered including characteristics of alternate systems for peaking power generation, viz gas turbines and coal fired cycling plants. Competitive benefit analysis of thermal energy storage systems with alternate systems for peaking power generation and recommendations for development and field test of thermal energy storage with a conventional utility are included. Results indicate that thermal energy storage is only marginally competitive with coal fired cycling power plants and gas turbines for peaking power generation. J.M.S.

N80-22795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INDUSTRIAL STORAGE APPLICATIONS OVERVIEW
Rudolph A. Duscha *In its* Thermal Energy Storage Mar. 1980 p 85-94 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The implementation of a technology demonstration for the food processing industry, development and technology demonstrations for selected near-term, in-plant applications and advanced industrial applications of thermal energy storage are overviewed. R.E.S.

N80-22796*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
APPLICATIONS OF THERMAL ENERGY STORAGE TO WASTE HEAT RECOVERY IN THE FOOD PROCESSING INDUSTRY
F. Wojnar (Heinz (H. J.) Co.) and Wayne L. Lunberg *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 95-104 (For primary document see N80-22788 13-44)
(Contract EC-77-C-01-5002)
Avail: NTIS HC A99/MF A01 CSCL 10B

A study to assess the potential for waste heat recovery in the food industry and to evaluate prospective waste heat recovery system concepts employing thermal energy storage was conducted. The study found that the recovery of waste heat in canning facilities can be performed in significant quantities using systems involving thermal energy storage that are both practical and economical. A demonstration project is proposed to determine actual waste heat recovery costs and benefits and to encourage system implementation by the food industry. R.E.S.

N80-22797*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLLECTION AND DISSEMINATION OF TES SYSTEM INFORMATION FOR THE PAPER AND PULP INDUSTRY
M. W. Dietrich and Howard Edde (Edde (Howard), Inc., Bellevue, Wash.) *In its* Thermal Energy Storage Mar. 1980 p 105-111 (For primary document see N80-22788 13-44)

(Contract DEN3-190)
Avail: NTIS HC A99/MF A01 CSCL 10B

A survey of U.S. and international paper and pulp mills using thermal energy storage (TES) systems as a part of their production processes was conducted to obtain sufficient operating data to conduct a benefits analysis encompassing: (1) an energy conservation assessment, (2) an economic benefits analysis, and (3) an environmental impact assessment. An information dissemination plan was then proposed to effectively present the benefits of TES to the U.S. paper and pulp industry. R.E.S.

N80-22798*# Sandia Labs., Livermore, Calif.
SOLAR THERMAL POWER STORAGE APPLICATIONS LEAD LABORATORY OVERVIEW
Lee G. Radosevich *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 113-124 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The implementation of the applications elements of the thermal energy storage for Solar Thermal Applications program is described. The program includes the accelerated development of thermal storage technologies matched to solar thermal power system requirements and scheduled milestones. The program concentrates on storage development in the FY80 to 85 time period with emphasis on the more near-term solar thermal power system application. R.E.S.

N80-22799*# Sandia Labs., Albuquerque, N. Mex.
THERMAL STORAGE EXPERIENCE AT THE MSSTF AND PLANS FOR THE FUTURE
Thomas D. Harrison and Robert A. Randall *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 125-130 ref (For primary document see N80-22788 13-44)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A99/MF A01 CSCL 10C

The background of thermal storage development at the Midtemperature Solar Systems Test Facility is reviewed. The problems which were encountered are discussed and a course of action for resolving the problems is outlined. Scaling effects of going from laboratory models to full-size applications were determined and applied to thermal storage needs in near-term solar projects. R.E.S.

N80-22800*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL ENERGY STORAGE EFFORT AT JPL
Donald L. Young *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 131-140 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The technical, operational, and economic readiness of parabolic dish systems for electric and thermal applications was investigated. A parabolic dish system was then developed to the point at which subsequent commercialization activities can lead to successful market penetration. The immediate possible applications of the dish system to thermal energy storage are discussed. R.E.S.

N80-22801*# Martin Marietta Corp., Baltimore, Md.
INTERNALLY INSULATED THERMAL STORAGE SYSTEM DEVELOPMENT PROGRAM
Owen L. Scott *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 141-155 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

A cost effective thermal storage system for a solar central receiver power system using molten salt stored in internally insulated carbon steel tanks is described. Factors discussed include: testing of internal insulation materials in molten salt; preliminary design of storage tanks, including insulation and liner installation; optimization of the storage configuration; and definition of a subsystem research experiment to demonstrate the system. A thermal analytical model and analysis of a thermocline tank was performed. Data from a present thermocline test tank was compared to gain confidence in the analytical approach. A computer analysis of the various storage system parameters (insulation thickness, number of tanks, tank geometry, etc.) showed that (1) the most cost-effective configuration was a small number of large cylindrical tanks, and (2) the optimum is set by the mechanical constraints of the system, such as soil bearing strength and tank hoop stress, not by the economics. M.G.

N80-22802*# Sandia Labs., Livermore, Calif.
SANDIA LABORATORIES IN-HOUSE ACTIVITIES IN SUPPORT OF SOLAR THERMAL LARGE POWER APPLICATIONS
Raymond W. Mar *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 157-161 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The development of thermal energy storage subsystems for solar thermal large power applications is described. The emphasis is on characterizing the behavior of molten nitrate salts with regard to thermal decomposition, environmental interactions, and corrosion. Electrochemical techniques to determine the ionic species in the melt and for use in real time studies of corrosion are also briefly discussed. M.G.

N80-22803*# Texas Univ. at Austin. Energy Foundation of Texas.
HIGH TEMPERATURE UNDERGROUND THERMAL ENERGY STORAGE SYSTEM FOR SOLAR ENERGY
R. Eugene Collins *In* NASA. Lewis Res. Center Thermal Energy Storage Aug. 1980 p 163-171 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The activities feasibility of high temperature underground thermal storage of energy was investigated. Results indicate that salt cavern storage of hot oil is both technically and economically feasible as a method of storing huge quantities of heat at relatively low cost. One particular system identified utilizes a gravel filled cavern leached within a salt dome. Thermal losses are shown to be less than one percent of cyclically transferred heat. A system like this having a 40 MW sub t transfer rate capability and over eight hours of storage capacity is shown to cost about $13.50 per KWh sub t. M.G.

N80-22804*# Comstock and Wescott, Inc., Cambridge, Mass.
DEVELOPMENT OF A THERMAL STORAGE MODULE USING MODIFIED ANHYDROUS SODIUM HYDROXIDE
Richard E. Rice and Peter E. Rowny *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 173-181 ref (For primary document see N80-22788 13-44)
(Contract DEN3-138)
Avail: NTIS HC A99/MF A01 CSCL 10C

The laboratory scale testing of a modified anhydrous NaOH latent heat storage concept for small solar thermal power systems such as total energy systems utilizing organic Rankine systems is discussed. A diagnostic test on the thermal energy storage module and an investigation of alternative heat transfer fluids and heat exchange concepts are specifically addressed. A previously developed computer simulation model is modified to predict the performance of the module in a solar total energy system environment. In addition, the computer model is expanded to investigate parametrically the incorporation of a second heat exchange inside the module which will vaporize and superheat the Rankine cycle power fluid. M.G.

N80-22805*# Institute of Gas Technology, Chicago, Ill.
HIGH-TEMPERATURE MOLTEN SALT THERMAL ENERGY STORAGE SYSTEMS FOR SOLAR APPLICATIONS
Randy J. Petri and T. D. Claar *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 183-190 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

Alkali and alkaline earth carbonate latent-heat storage salts, metallic containment materials, and thermal conductivity enhancement materials were investigated to satisfy the high temperature (704 to 871 C) thermal energy storage requirements of advanced solar-thermal power generation concepts are described. Properties of the following six salts selected for compatibility studies are given: three pure carbonates, K_2CO_3, Li_2CO_3 and Na_2CO_3; two eutectic mixtures, $BaCO_3/Na_2CO_3$ and $K_2CO_3/NaCO_3$, and one off-eutectic mixture of Na_2CO_3/K_2CO_3. M.G.

N80-22806*# Oak Ridge National Lab., Tenn.
BUILDING HEATING AND COOLING APPLICATIONS THERMAL ENERGY STORAGE PROGRAM OVERVIEW
D. M. Eissenberg *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 191-201 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

Thermal energy storage technology and development of building heating and cooling applications in the residential and commercial sectors is outlined. Three elements are identified to undergo an applications assessment, technology development, and demonstration. Emphasis is given to utility load management thermal energy system application where the stress is on the 'customer side of the meter'. Thermal storage subsystems for space conditioning and conservation means of increased thermal mass within the building envelope and by means of low-grade waste heat recovery are covered. M.G.

N80-22807*# Oak Ridge National Lab., Tenn.
SUBCONTRACTED ACTIVITIES RELATED TO TES FOR BUILDING HEATING AND COOLING
Jim Martin *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 203-211 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The subcontract program elements related to thermal energy storage for building heating and cooling systems are outlined. The following factors are included: subcontracts in the utility load management application area; life and stability testing of packaged low cost energy storage materials; and development of thermal energy storage systems for residential space cooling. Resistance storage heater component development, demonstration of storage heater systems for residential applications, and simulation and evaluation of latent heat thermal energy storage (heat pump systems) are also discussed. Application of thermal energy storage for solar application and twin cities district heating are covered including an application analysis and technology assessment of thermal energy storage. R.C.T.

N80-22808*# Purdue Univ., Lafayette, Ind.
THERMAL ENERGY STORAGE TESTING FACILITY
R. J. Schoenhals, H. F. Kuehlert, and C. P. Lin *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 223-231 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The thermal performance of resistance storage heaters in respect to current standards is determined. The design and construction of a storage heater test facility with capability for measuring the performance of electric resistance heated storage units is described. The performance of commercial units are compared based on existing standards. Additional performance standards are proposed. R.C.T.

N80-22809*# Rocket Research Corp., Redmond, Wash.
APPLICATION OF THERMAL ENERGY STORAGE TO PROCESS HEAT RECOVERY IN THE ALUMINUM INDUSTRY
John McCabe *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 233-237 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10B

The economic viability and the institutional compatibility of a district heating system in the city of Bellingham, Washington are assessed and the technical and economic advantages of using thermal energy storage methods are determined. R.C.T.

N80-22810*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
HEAT STORAGE CAPABILITY OF A ROLLING CYLINDER USING GLAUBER'S SALT
C. S. Herrick and K. P. Zarnoch *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 239-259 refs (For primary document see N80-22788 13-44)
(Contract EM-78-C-05-5759)
Avail: NTIS HC A99/MF A01 CSCL 10C

The rolling cylinder phase change heat storage concept was developed to the point where a prototype design is completed and a cost analysis is prepared. A series of experimental and analytical tasks are defined to establish the thermal, mechanical, and materials behavior of rolling cylinder devices. These tasks include: analyses of internal and external heat transfer; performance and lifetime testing of the phase change materials; corrosion evaluation; development of a mathematical model; and design of a prototype and associated test equipment. R.C.T.

N80-22811*# Oak Ridge National Lab., Tenn.
THERMAL ENERGY STORAGE TEST FACILITY
Mark P. Ternes *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 261-264 (For primary document see N80-22788 13-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A99/MF A01 CSCL 10C

The thermal behavior of prototype thermal energy storage units (TES) in both heating and cooling modes is determined. Improved and advanced storage systems are developed and performance standards are proposed. The design and construction of a thermal cycling facility for determining the thermal behavior of full scale TES units is described. The facility has the capability for testing with both liquid and air heat transport, at variable heat input/extraction rates, over a temperature range of 0 to 280 F. R.C.T.

N80-22812*# Oak Ridge National Lab., Tenn.
MATHEMATICAL MODELING OF MOVING BOUNDARY PROBLEMS IN THERMAL ENERGY STORAGE
A. D. Solomon *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 265-270 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The capability for predicting the performance of thermal energy storage (RES) subsystems and components using PCM's based on mathematical and physical models is developed. Mathematical models of the dynamic thermal behavior of (TES) subsystems using PCM's based on solutions of the moving boundary thermal conduction problem and on heat and mass transfer engineering correlations are also discussed. R.C.T.

N80-22813*# Oak Ridge National Lab., Tenn.
CRAWL SPACE ASSISTED HEAT PUMP
Mark P. Ternes *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 271-276 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 20D

A variety of experiments and simulations, currently being designed or underway, to determine the feasibility of conditioning the source air of an air to air heat pump using stored ground heat or cool to produce higher seasonal COP's and net energy savings are discussed. The ground would condition ambient air as it is drawn through the crawl space of a house. Tests designed to evaluate the feasibility of the concept, to determine the amount of heat or cool available from the ground, to study the effect of the system on the heating and cooling loads of the house, to study possible mechanisms which could enhance heat flow through the ground, and to determine if diurnal temperature swings are necessary to achieve successful system performance are described. A.W.H.

N80-22814*# Delaware Univ., Wilmington. Inst. of Energy Conversion.
LIFE AND STABILITY TESTING OF PACKAGED LOW-COST ENERGY STORAGE MATERIALS
Galen R. Frysinger *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 277-281 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

Thermal cycling and performance tests, performed to verify the package integrity, life, and stability of the chub packaged materials system for storage coolness with application to residential air conditioning, are described. The moisture vapor retention characteristics of the laminate film for long term chub performance was determined. The stability, mechanical integrity, and thermal performance of chubs following mechanical shock, vibration, and temperature extremes is reported. A.W.H.

N80-22815*# General Electric Co., Santa Barbara, Calif.
EVALUATION OF THERMAL ENERGY STORAGE FOR THE

PROPOSED TWIN CITIES DISTRICT HEATING SYSTEM
Charles F. Meyer *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 283-295 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The technical and economic feasibility of incorporating thermal energy storage components into the proposed Twin Cities District heating project was evaluated. The technical status of the project is reviewed and conceptual designs of district heating systems with and without thermal energy storage were compared in terms of estimated capital requirements, fuel consumption, delivered energy cost, and environmental aspects. The thermal energy storage system is based on cogeneration and the storage of heat in aquifers. A.W.H.

N80-22816*# Research Triangle Inst., Research Triangle Park, N. C.
SIMULATION AND EVALUATION OF LATENT HEAT THERMAL ENERGY STORAGE
Tony W. Sigmon *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 297-305 refs (For primary document see N80-22788 13-44)
(Contract DE-AC01-79ET-26707)
Avail: NTIS HC A99/MF A01 CSCL 10C

The relative value of thermal energy storage (TES) for heat pump storage (heating and cooling) as a function of storage temperature, mode of storage (hotside or coldside), geographic locations, and utility time of use rate structures were derived. Computer models used to simulate the performance of a number of TES/heat pump configurations are described. The models are based on existing performance data of heat pump components, available building thermal load computational procedures, and generalized TES subsystem design. Life cycle costs computed for each site, configuration, and rate structure are discussed. A.W.H.

N80-22817*# Argonne National Lab., Ill.
EXPERIMENTAL EVALUATION OF THERMAL ENERGY STORAGE
J. G. Asbury and H. N. Hersh *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 307-314 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The technical performance of commercially available thermal energy storage (TES) residential heating units under severe weather conditions is discussed. The benefits and costs of TES to the user and utility companies were assessed. The TES issues, research and development needs, and barriers to commercialization were identified. The field tests which determined the performance characteristics for the TES are described and the TES systems, which included both ceramic and hydronic systems, are compared. A.W.H.

N80-22818*# Dayton Univ., Ohio.
DEVELOPMENT OF OPTIMUM PROCESS FOR ELECTRON BEAM CROSS-LINKING OF HIGH DENSITY POLYETHYLENE THERMAL ENERGY STORAGE PELLETS. PROCESS SCALE-UP AND PRODUCTION OF APPLICATION QUALITIES OF MATERIAL
Ival O. Salyer *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 315-327 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The electron irradiation conditions required to prepare thermally stable high density polyethylene (HDPE) were defined. The conditions were defined by evaluating the heat of fusion and the melting temperature of several HDPE specimens. The performance tests conducted on the specimens, including the thermal cycling tests in the thermal energy storage unit are described. The electron beam irradiation tests performed on the specimens, in which the total radiation dose received by the pellets, the electron beam current, the accelerating potential, and the atmospheres were varied, are discussed. A.W.H.

N80-22819*# Honeywell, Inc., Minneapolis, Minn.
ACTIVE HEAT EXCHANGE SYSTEM DEVELOPMENT FOR LATENT HEAT THERMAL ENERGY STORAGE
Richard T. LeFrois *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 337-352 (For primary document see N80-22788 13-44)
(Contract DEN3-38)
Avail: NTIS HC A99/MF A01 CSCL 10C

Alternative mechanizations of active heat exchange concepts were analyzed for use with heat of fusion Phase Change Materials (PCM's) in the temperature range of 250 C to 350 C for solar and conventional power plant applications. Over 24 heat exchange concepts were reviewed, and eight were selected for detailed assessment. Two candidates were chosen for small-scale experimentation: a coated tube and shell that exchanger, and a direct contact reflux boiler. A dilute eutectic mixture of sodium nitrate and sodium hydroxide was selected as the PCM from over fifty inorganic salt mixtures investigated. Preliminary experiments with various tube coatings indicated that a nickel or chrome plating of Teflon or Ryton coating had promise of being successful. An electroless nickel plating was selected for further testing. A series of tests with nickel-plated heat transfer tubes showed that the solidifying sodium nitrate adhered to the tubes and the experiment failed to meet the required discharge heat transfer rate of 10 kW(t). Testing of the reflux boiler is under way. A.R.H.

N80-22820*# Naval Research Lab., Washington, D. C.
ENERGY STORAGE-BOILER TANK. Progress Report, 1979
Talbot A. Chubb, J. J. Nemecek, and D. E. Simmons *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 353-359 (For primary document see N80-22788 13-44)
(Contract EC-77-A-31-1024; NRL Proj. M003)
Avail: NTIS HC A99/MF A01 CSCL 10B

Activities performed in an effort to demonstrate heat of fusion energy storage in containerized salts are reported. The properties and cycle life characteristics of a eutectic salt having a boiling point of about 385 C (NaCl, KCl, $MgCl_2$) were determined. M-terphenyl was chosen as the heat transfer fluid. Compatibility studies were conducted and mild steel containers were selected. The design and fabrication of a 2MWh storage boiler tank are discussed. A.R.H.

N80-22821*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
THE SERI SOLAR ENERGY STORAGE PROGRAM
Robert J. Copeland, John D. Wright, and Charles E. Wyman *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 361-374 refs (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

In support of the DOE thermal and chemical energy storage program, the solar energy storage program (SERI) provides research on advanced technologies, systems analyses, and assessments of thermal energy storage for solar applications in support of the Thermal and Chemical Energy Storage Program of the DOE Division of Energy Storage Systems. Currently, research is in progress on direct contact latent heat storage and thermochemical energy storage and transport. Systems analyses are being performed of thermal energy storage for solar thermal applications, and surveys and assessments are being prepared of thermal energy storage in solar applications. A ranking methodology for comparing thermal storage systems (performance and cost) is presented. Research in latent heat storage and thermochemical storage and transport is reported. A.R.H.

N80-22822*# Grumman Aerospace Corp., Bethpage, N.Y.
ACTIVE HEAT EXCHANGE SYSTEM DEVELOPMENT FOR LATENT HEAT THERMAL ENERGY STORAGE
Joseph Alario and Robert Haslett *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 375-383 (For primary document see N80-22788 13-44)
(Contract DEN3-39)
Avail: NTIS HC A99/MF A01 CSCL 10C

Various active heat exchange concepts were identified from among three generic categories: scrapers, agitators/vibrators and slurries. The more practical ones were given a more detailed technical evaluation and an economic comparison with a passive tube-shell design for a reference application. Two concepts selected for hardware development are a direct contact heat exchanger in which molten salt droplets are injected into a cooler counterflowing stream of liquid metal carrier fluid, and a rotating drum scraper in which molten salt is sprayed onto the circumfer-

ence of a rotating drum, which contains the fluid heat sink in an internal annulus near the surface. A fixed scraper blade removes the solidified salt from the surface which has been nickel plated to decrease adhesion forces. Suitable phase change material (PCM) storage media with melting points in the temperature range of interest (250 C to 400 C) were investigated. The specific salt recommended for laboratory tests was a chloride eutectic (20.5KCl-24/5 NaCl-55.0MgCl 2% by wt.), with a nominal melting point of 385 C. A.R.H.

N80-22823*# Delaware Univ., Newark.
HEAT STORAGE IN ALLOY TRANSFORMATIONS
C. Ernest Birchenall *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 385-390 (For primary document see N80-22788 13-44)
(Grant NsG-3184)
Avail: NTIS HC A99/MF A01 CSCL 10C

Heats of transformation of eutectic alloys were measured for many binary and ternary systems by differential scanning calorimetry and thermal analysis. Only the relatively cheap and plentiful elements Mg, Al, Si, P, Ca, Cu, Zn were considered. A method for measuring volume change during transformation was developed using x-ray absorption in a confined sample. Thermal expansion coefficients of both solid and liquid states of aluminum and of its eutectics with copper and with silicon also were determined. Preliminary evaluation of containment materials lead to the selection of silicon carbide as the initial material for study. Possible applications of alloy PCMs for heat storage in conventional and solar central power stations, small solar receivers and industrial furnace operations are under consideration. A.R.H.

N80-22824*# Clemson Univ., S.C. Dept. of Chemical Engineering.
IMMISCIBLE FLUID: HEAT OF FUSION HEAT STORAGE SYSTEM
D. D. Edie, S. S. Melsheimer, and J. C. Mullins *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 391-399 refs (For primary document see N80-22788 13-44)
(Contract EY-76-S-05-5190)
Avail: NTIS HC A99/MF A01 CSCL 10C

Both heat and mass transfer in direct contact aqueous crystallizing systems were studied as part of a program designed to evaluate the feasibility of direct contact heat transfer in phase change storage using aqueous salt system. Major research areas, discussed include (1) crystal growth velocity study on selected salts; (2) selection of salt solutions; (3) selection of immiscible fluids; (4) studies of heat transfer and system geometry; and (5) system demonstration. A.R.H.

N80-22825*# Pacific Northwest Lab., Richland, Wash.
AQUIFER THERMAL ENERGY STORAGE PROGRAM
Kenneth Fox *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 401-411 (For primary document see N80-22788 13-44)
(Contract EY-76-C-06-1830)
Avail: NTIS HC A99/MF A01 CSCL 10C

The purpose of the Aquifer Thermal Energy Storage Demonstration Program is to stimulate the interest of industry by demonstrating the feasibility of using a geological formation for seasonal thermal energy storage, thereby, reducing crude oil consumption, minimizing thermal pollution, and significantly reducing utility capital investments required to account for peak power requirements. This purpose will be served if several diverse projects can be operated which will demonstrate the technical, economic, environmental, and institutional feasibility of aquifer thermal energy storage systems. Author

N80-22826*# California Univ., Berkeley. Lawrence Berkeley Lab.
SEASONAL THERMAL ENERGY STORAGE IN AQUIFERS: MATHEMATICAL MODELING STUDIES IN 1979
Chin Fu Tsang *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 581-589 refs (For primary document see N80-22788 13-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A99/MF A01 CSCL 10C

A numerical model of water and heat flow in geologic media was developed, verified, and tested. The hydraulic parameters (transmittivity and storativity) and the location of a linear hydrologic barrier were simulated and compared with results from field experiments involving two injection-storage-recovery cycles. For both cycles, the initial simulated and observed temperatures agree (55c). A.R.H.

N80-22827*# Texas A&M Research Foundation, College Station.
COLD WATER AQUIFER STORAGE
Donald L. Reddell, Richard R. Davison, and William B. Harris *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 591-599 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

A working prototype system is described in which water is pumped from an aquifer at 70 F in the winter time, chilled to a temperature of less than 50 F, injected into a ground-water aquifer, stored for a period of several months, pumped back to the surface in the summer time. A total of 8.1 million gallons of chilled water at an average temperature of 48 F were injected. This was followed by a storage period of 100 days. The recovery cycle was completed a year later with a total of 8.1 million gallons recovered. Approximately 20 percent of the chill energy was recovered. A.R.H.

N80-22828*# Auburn Univ., Ala. Water Resources Research Inst.
HOT-WATER AQUIFER STORAGE: A FIELD TEST
A. D. Parr, F. J. Molz, and P. F. Andersen *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 601-606 (For primary document see N80-22788 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

The basic water injection cycle used in a large-scale field study of heat storage in a confined aquifer near Mobile, Alabama is described. Water was pumped from an upper semi-confined aquifer, passed through a boiler where it was heated to a temperature of about 55 C, and injected into a medium sand confined aquifer. The injection well has a 6-inch (15-cm) partially-penetrating steel screen. The top of the storage formation is about 40 meters below the surface and the formation thickness is about 21 meters. In the first cycle, after a storage period of 51 days, the injection well was pumped until the temperature of the recovered water dropped to 33 c. At that point 55,300 cubic meters of water had been withdrawn and 66 percent of the injected energy had been recovered. The recovery period for the second cycle continued until the water temperature was 27.5 C and 100,100 cubic meters of water was recovered. At the end of the cycle about 90 percent of the energy injected during the cycle had been recovered. A.R.H.

N80-22829*# Pacific Northwest Lab., Richland, Wash.
EQUILIBRIUM GEOCHEMICAL MODELING OF A SEASONAL THERMAL ENERGY STORAGE AQUIFER FIELD TEST
J. S. Stottlemyre *In* NASA. Lewis Res. Center Thermal Energy Storage Mar. 1980 p 607-619 refs (For primary document see N80-22788 13-44)
(Contract EY-76-C-06-1830)
Avail: NTIS HC A99/MF A01 CSCL 10C

A geochemical mathematical modeling study designed to investigate the well plugging problems encountered at the Auburn University experimental field tests is summarized. The results, primarily of qualitative interest, include: (1) loss of injectivity was probably due to a combination of native particulate plugging and clay swelling and dispersion; (2) fluid-fluid incompatibilities, hydrothermal reactions, and oxidation reactions were of insignificant magnitude or too slow to have contributed markedly to the plugging; and (3) the potential for and contributions from temperature-induced dissolved gas solubility reductions, capillary boundary layer viscosity increases, and microstructural deformation cannot be deconvolved from the available data. Author

N80-22830*# Tuskegee Inst., Ala. Dept. of Electrical Engineering.
MEASUREMENT OF LOSS ANGLE, VOLUME RESISTIVITY AND SURFACE RESISTIVITY OF INSULATING MATERIALS USED ON SOLAR CELLS Final Report
C. V. Doreswamy Apr. 1980 39 p refs
(Contract NsG-8038)
(NASA-CR-162925) Avail: NTIS HC A03/MF A01 CSCL 10A

The complete measuring and test system developed to measure the quality and the stability of insulating materials used on solar cell arrays for space application is described. The test set up and measurements are primarily aimed at the measurement and analysis of the degradation of the electrical insulating properties of material used on solar cells. Degradation characteristics of the material subject to thermal cycling, space plasma and very high electrical fields individually and in combination can be investigated. R.E.S.

N80-22831*# IBM Watson Research Center, Yorktown Heights, N.Y.

OPTIMIZATION OF SOLAR CELLS FOR AIR MASS ZERO OPERATION AND STUDY OF SOLAR CELLS AT HIGH TEMPERATURES, PHASE 4 Final Report

H. J. Hovel and J. M. Woodall Mar. 1980 56 p refs

(Contract NAS1-12812)

(NASA-CR-159230) Avail: NTIS HC A04/MF A01 CSCL 10A

The Pd contact to GaAs was studied using backscattering, Auger analysis, and sheet resistance measurements. Several metallurgical phases were present at low temperatures, but PdGa was the dominant phase in samples annealed at 500 C. Ti/Pd/Ag contacts appeared to have the lowest contact resistance. Etchback epitaxy (EBE) was compared to saturated melt epitaxy (SME) method of growing liquid phase epitaxial layers. The SME method resulted in a lower density of Ga microdroplets in the grown layer, although the best solar cells were made by the EBE method. Photoluminescence was developed as a tool for contactless analysis of GaAs cells. Efficiencies of over 8 percent were measured at 250 C. R.E.S.

N80-22832# GTE Labs., Inc., Waltham, Mass.

INVESTIGATION OF METHODS TO ELIMINATE VOLTAGE DELAY IN Li/SOCl SUB 2 CELLS Quarterly Technical Report, 19 Dec. 1978 - 19 Mar. 1979

Marc S. Dobrusin, Anthony Lombardi, Carl R. Schlaikjer, and Clifton A. Young Nov. 1979 20 p refs

(Contract DAAB07-78-C-0558; DA Proj. 1L1-61102-AH-47) (AD-A080125; DELET-TR-78-0558-2; QTR-2) Avail: NTIS HC A02/MF A01 CSCL 10/3

The film growth on lithium metal samples stored in LiAlCl4/SOCl2 electrolyte was measured as a function of storage temperature and lithium area to electrolyte volume (A/V) ratio. Micropolarization techniques were used to determine the capacitance and resistance of solid LiCl films on lithium electrodes, and from these values the thickness and resistivity of the films were calculated. When measured at higher temperature, the resistivity of LiCl layers was found to be lower. For higher A/V ratios, the film was thicker. The salt Li2B10Cl10 was found to have lower thermal stability than anticipated, and underwent partial decomposition when heated above 200 C to remove tetrahydrofuran following purification by crystallization from this solvent. GRA

N80-22833# GTE Labs., Inc., Waltham, Mass.

INVESTIGATION OF METHODS TO ELIMINATE VOLTAGE DELAY IN Li/SOCl SUB 2 CELLS Quarterly Technical Report, 19 Mar. - 19 Jun. 1979

Clifton A. Young, Marc S. Dobrusin, and Carl R. Schlaikjer Nov. 1979 60 p refs

(Contract DAAB07-78-C-0558; DA Proj. 1L1-61102-AH-47) (AD-A080194; DELET-TR-78-0558-3; QTR-3) Avail: NTIS HC A04/MF A01 CSCL 10/3

The rate of growth of passivating films on lithium in SOCl2 and 1.8 M LiAlCl4/SOCl2 electrolyte has been measured by weight gain of stored lithium samples, and by pulse polarization measurements on stored cells. The film on lithium when measured in this way was found to be much thicker than when calculated from capacitance measured by pulse polarization. Micropolarization and capacitance measurements of lithium stored in 0.25 M Li2B10Cl10/SOCl2 have indicated that the film formed in this electrolyte is much thinner than that formed in 1.8 M LiAlCl4/SOCl2. GRA

N80-22834# Defence Research Establishment, Ottawa. (Ontario). Chemical Sources Sect.

EVALUATION OF BB-248/U LEAD ACID BATTERY DURING CHARGE-DISCHARGE CYCLES AT LOW TEMPERATURE

G. R. L. Brossard and L. D. Gallop Aug. 1979 38 p refs In ENGLISH; FRENCH summary

(AD-A074845; DREO-TN-79-15) Avail: NTIS HC A03/MF A01 CSCL 10/3

The behaviour of the lead-acid battery type BB-248/U has been studied during many consecutive charge-discharge cycles. The cranking current and the minimum terminal voltage were 285 A (or 300 A) and 6 V, respectively. The working temperature was successively room temperature, 0 C, -20 C and -40 C while the rechargeability period was only 2 hours. This work shows that such a rechargeability period - with a maximum charge current and an applied terminal voltage of 20 A and 14.25 V (or 16 V), respectively - is far too short to completely recharge the battery. Moreover, the rechargeability rate is only very slightly affected by the value of the maximum applied thermal voltage in the range of 14.25 V to 16 V. Finally, a significant decrease of reserve capacity measured at room temperature has been observed after many charge-discharge cycles at low temperatures. GRA

N80-22835# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Metals and Ceramics Div.

ZIRCONIUM POWER CHRACTERIZATION AND PROCESS IMPROVEMENT FOR THERMAL BATTERIES Final Report, Sep. 1975 - Dec. 1976

Robert F. Geisendorfer and K. S. Mazdiyasni Nov. 1979 127 p refs

(AF Proj. 7350)

(AD-A080344; AFML-TR-79-4069) Avail: NTIS HC A07/MF A01 CSCL 10/3

The inhouse program has resulted in a survey and characterization of existing production raw materials and product Zr metal powder as a heat source in the AF Maverick thermal battery. The variables most likely causing inconsistency and ignition sensitivity of zirconium metal powders are identified. The criteria for design and safety requirements for a laboratory scale zirconium-reduction-leach facility were established. The reduction and leach-wash cycle parameters were optimized to produce consistent quality fine particle 1-2-micrometer zirconium powder. The reduction scale up 400 grams per batch was achieved in order to produce sufficient quantities of Zr metal powder for performance tests and to evaluate variables. The technology was transferred to the industry for production of 50 pounds/batch Zr metal was accomplished. GRA

N80-22836# Mallory (P. R.) and Co., Inc., Burlington, Mass. Lab. for Physical Science.

LITHIUM-THIONYL CHLORIDE BATTERY Quarterly Report, 1 Aug. - 31 Oct. 1979

A. N. Dey, N. Hamilton, W. Bowden, P. Witalis, and D. Cubbison Feb. 1980 60 p refs

(Contract DAAB07-78-C-0563; DA Proj. 1L1-62705-AH-94) (AD-A080734; DELET-TR-78-0563-4; QR-4) Avail: NTIS HC A04/MF A01 CSCL 10/3

We have demonstrated a cell capacity of greater than 20 Amp-hr for the three inch flat cell on the GLLD test. We optimized these cells with regard to electrode area and cathode additive. This cell has now exceeded design performance goals. We optimized the very high rate wound D cell for electrolyte concentration, cathode additive and electrode length. The high rate D cells delivered 24 bursts or 8 Amp. hr/cell on the GLLD test cycle compared to 3 bursts from the currently used Ni/Cd batteries. We developed the 1.8 inch diameter cylindrical cell and tested it on the GLLD test. This cell delivered 12-13 Amp-hrs which was inferior to the flat cell and the high rate D cell. Accordingly, we discontinued any further development on this cell. We converted our test apparatus to the new GLLD test cycle which consists of alternating 20 Amp and 3.2 Amp pulses. The flat cells performed equally well under this new test regime. GRA

N80-22837# General Atomic Co., San Diego, Calif.

CLOSED-CYCLE GAS TURBINE: A PROVEN COGENERATION PLANT ADAPTABLE TO FOSSIL, NUCLEAR, AND SOLAR HEAT SOURCES

C. F. McDonald Jun. 1979 71 p refs Presented at Conf. on Energy Conversion and Solar Energy, Milan, Italy, 26 Sep. 1979

(Contract EY-76-C-03-0167)
(GA-A-15322; CONF-790383-1) Avail: NTIS HC A04/MF A01

Existing operational closed-cycle gas turbine (CCGT) plants and projects nuclear, fossil, and solar plants of the future are reviewed. The benefits of the CCGT are discussed. DOE

N80-22838# Los Alamos Scientific Lab., N. Mex.
SUPERCONDUCTING MAGNETIC ENERGY STORAGE FOR ELECTRIC UTILITIES AND FUSION SYSTEMS
J. D. Rogers 1978 45 p refs Presented at the Instr. Soc. of Am. Meeting, Philadelphia, 16 Oct. 1978
(Contract W-7405-eng-36)
(LA-UR-78-1213; CONF-781025-1) Avail: NTIS HC A03/MF A01

Energy storage inductors, under development for load leveling and transmission line stabilization in electric utility systems and for driving magnetic confinement and plasma heating coils in fusion energy system are described. Superconducting magnetic energy storage (SMES) systems, which will store and deliver electrical energy for load leveling, peak shaving, and the stabilization of electric utility network are discussed. In the fusion area, inductive energy transfer and storage is being developed. Both 1-ms fast discharge theta pinch systems and 1 to 2-s slow energy transfer Tokamak systems have been demonstrated. The major components and the method of operation of a SMES unit are decribed, and potential applications of different size SMES systems in electric power grids are assessed. Results are given of a reference design for a 10-Gwh unit for load leveling, of a 30-MJ coil proposed for system stabilization, and of tests with a small-scale, 100-kj magnetic energy storage system. Fusion energy storage and transfer are results included. The common technology base for the various storage systems is examined.
A.R.H.

N80-22839# California Univ., Livermore. Lawrence Livermore Lab.
SOLAR-HEATED GAS-TURBINE PROCESS USING SULFUR OXIDES FOR POWER PRODUCTION AND ENERGY STORAGE M.S. Thesis
George Kohler Tyson, Scott Lynn, and Alan Foss Sep. 1979 108 p refs
(Contract W-7405-eng-48)
(LBL-9472) Avail: NTIS HC A06/MF A01

If any system of solar power generation is to provide a significant fraction of the power requirements of a community, some means of economical energy storage must be used. A process configuration using the heat of reaction of 2 SO3 reversible 2 SO2 + O2 for energy storage was developed and evaluated. The process uses the sulfur oxides directly in a gas turbine in a hybrid Brayton-Rankine cycle to produce electricity. Heat for the system is supplied during sunlit hours by a field of heliostats focused on a central solar receiver. When sunlight is not available, the storage system provides the heat to drive the gas turbine. An efficient process configuration for this power cycle is proposed. Detailed material and energy balances are presented for a base case that represents a middle range of expected operating conditions. The average cost of the electricity produced is estimated to be 7.7 cents/kW/sub e/hr. DOE

N80-22840# Los Alamos Scientific Lab., N. Mex.
TECHNOLOGY ASSESSMENT OF WIND ENERGY CONVERSION SYSTEMS
R. W. Meier and T. J. Merson Sep. 1979 48 p refs
(Contract W-7405-eng-36)
(LA-8044-TASE) Avail: NTIS HC A03/MF A01

Environmental data for wind energy conversion systems (WECSs) were generated. Two candidates were chosen to characterize the WECS that might be deployed if this technology makes a significant contribution to the national energy requirements. One EECS is a large machine of 1.5-MW-rated capacity that can be used by utilities. The other WECS is a small machine that is characteristic of units that might be used to meet residential or small business energy requirements. Energy storage systems are discussed for each machine to address the intermittent nature of wind power. Cost estimates were made for both large and small systems as required for input to the strategic environmental assessment simulation computer program. Material requirements, based on current generation WECSs, are discussed and a general discussion of environmental impacts associated with WECS deployment is presented. DOE

N80-22841# Argonne National Lab., Ill. Systems Engineering and Technology Group.
UNDERGROUND PUMPED HYDROELECTRIC STORAGE (UPHS)
C. A. Blomquist, A. A. Frigo, and S. W. Tam Apr. 1979 42 p refs
(Contract W-31-109-eng-38)
(ANL/EES-TM-60) Avail: NTIS HC A03/MF A01

The operating characteristics of single- and double-stage, reversible, Francois-type pump turbines are discussed. System studies are discussed in terms of machinery costs, plant sizes, and pump-turbine efficiencies, and results and conclusions are presented. In general, the utilization of advanced turbomachinery seems to be justified for underground pumped hydroelectric storage plants. DOE

N80-22842# Oak Ridge National Lab., Tenn. Energy and Environmental Systems Div.
LOW TEMPERATURE THERMAL-ENERGY STORAGE
C. S. Seagaser and J. E. Christian Mar. 1979 86 p refs
(Contract W-31-109-eng-38)
(ANL/CES/TE-79-3) Avail: NTIS HC A05/MF A01

Techniques and estimated costs of low temperature thermal energy storage (TES) devices applicable to integrated community energy systems (ICES) installations serving communities ranging in size from approximately 3000 to about 100,000 population are evaluated. The storage of thermal energy in the form of either hotness or coldness by virtue of a change in temperature of the material, or as latent heat of fusion in which the material changes from the liquid phase to the solid phase at essentially a constant temperature is described. Both types of material are considered for TES in ICES applications. DOE

N80-22843# Institute of Gas Technology, Chicago, Ill.
LITHIUM-METAL SULFIDE AND SODIUM-SULFUR BATTERIES FOR SOLAR ENERGY STORAGE
A. F. Sammells 19 Dec. 1978 12 p refs Presented at Reliability of Mater. for Solar Energy Workshop, Denver, Colo., 18 Dec. 1978
(Contract EC-77-C-02-4235)
(CONF-781228-3) Avail: NTIS HC A02/MF A01

The need for low-cost advanced batteries for solar energy storage is discussed, and the characteristics of the title batteries are described. The emphasis of the paper is on the status of materials problems associated with these batteries, including electrodes, current collectors, seals, and interelectrode spacing means. DOE

N80-22844# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
VACUUM DEPOSITED POLYCRYSTALLINE SILICON FILMS FOR SOLAR CELL APPLICATIONS Quarterly Technical Progress Report, 29 Sep. - 31 Dec. 1978
Charles Feldman 15 Jan. 1979 69 p refs
(Contract ET-78-A-03-2208)
(SAN-2208-T1; QTPR-1) Avail: NTIS HC A04/MF A01

A vacuum deposition technique for forming polycrystalline silicon solar cells is being explored. Transition metal diboride layers, being examined as the cell's bottom electrode, were deposited on single crystal (sapphire) and polycrystalline (alumina) Al2O3 substrates. Graphite substrates were also examined. Boron doped p-type silicon layers were formed by co-deposition in the vacuum at substrate temperature between 1100 C and 1200 C. Silicon grain size in the films was between 4 microns and 6 microns depending on the deposition conditions (supersaturation ratio). The n-type silicon layer was formed by gaseous diffusion into p-type layer. Detailed secondary-ion mass spectra analysis of silicon, metal borides and substrates was carried out. The most satisfactory devices used TaB2 electrodes on alumina substrates. Solar cell AM 2 efficiencies of 1.8 percent were about the same as the planar cells formed previously by double-diffusion. DOE

N80-22845# EIC, Inc., Newton, Mass.
METHANOL-BASED HEAT PUMPS FOR STORAGE OF SOLAR THERMAL ENERGY, PHASE 1 Final Report, 25 Apr. 1977 - 30 Jun. 1978
P. O. D. Offenhartz, M. J. Turner, F. C. Brown, R. B. Warren, J. P. Pemsler, and S. B. Brummer Jan. 1979 109 p refs Prepared for Sandia Labs., Livermore, Calif.
(Contract EY-76-C-04-0789)
(SAND-79-8188) Avail: NTIS HC A06/MF A01

Reaction of CH3OH vapor with a solid state inorganic salt substrate to produce a solid methanolated salt can be used as the basis of a combined solar heat pump/thermal energy storage system. Experiments carried out indicate that the reaction of CaO2 with CH3OH vapor to produce CaO2.2CH3OH is well suited to heating and cooling applications. The heat of reaction is about 20 kcal per mole of CH3OH, and kinetics and thermodynamics of the reaction appear adequate down to a CH3OH pool temperature around -10 C. Analytical and experimental work on the design of the heat exchanger for the reacting salt bed indicate that high rates of heat transfer can be accomplished in a reasonably compact system; the indicated energy density for the solid-phase reactant is in excess of 13,000 Btu/cu ft, assuming that the void fraction for anhydrous CaO2 is 85% or less. DOE

N80-22846# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
ENERGY INFORMATION DATA BASE CORPORATE AUTHOR ENTRIES, SUPPLEMENT 3 Progress Report, Jun. 1978 - Sep. 1979
Sep. 1979 51 p
(DOE/TIC-4585-R1-Suppl-3) Avail: NTIS HC A04/MF A01

This supplement contains additions to TID-4585-R1 and is intended for use with that publication. Supplements are cumulative from June 1978 until another revision is issued. DOE

N80-22847# Iowa State Univ. of Science and Technology, Ames. Dept. of Mechanical Engineering.
ENERGY CONSERVATION VIA HEAT TRANSFER ENHANCEMENT Quarterly Progress Report, 1 Jan. - 31 Mar. 1979
A. E. Bergles, G. H. Junkhan, and R. L. Webb Jun. 1979 48 p refs
(Contract ET-78-S-02-4649)
(COO-4649-5) Avail: NTIS HC A03/MF A01

The theory and practice of heat transfer enhancement are discussed. A technical literature file and manufacturers' file are reported and the initial patent technology information file is evaluated. Application studies on enhancement of waste heat recuperators and laminar internal flow heat transfer are described and data for the heat transfer and friction characteristics of internally finned tubes is discussed. Natural convection from rough surfaces is assessed. Major effort was directed toward planning of the Research Workshop on Energy Conservation Through Enhanced Heat Transfer. The Workshop, scheduled for May 24 and May 25, 1979 in Chicago, will be co-sponsored by NSF. DOE

N80-22848# Midwest Research Inst., Golden, Colo.
END-USE MATCHING OF SOLAR ENERGY SYSTEMS
F. Kreith, D. Kearney, and A. Bejan (Colo. Univ., Boulder) 1979 25 p refs Presented at the 2d Law of Thermodyn. Workshop, Washington, D.C., 14-16 Aug. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-34-325) Avail: NTIS HC A02/MF A01

The choice among available energy sources for a given task requires technical and economic tradeoffs on the part of the individual investor. From the national perspective, however, the effectiveness with which available energy sources are utilized may well become an overriding consideration. End-use matching is a procedure for introducing solar energy into the national energy infrastructure. The result of end-use matching is an identification of the most cost-effective combination of process energy needs, solar collector technology, geographic location, and economics by matching currently available solar system hardware with particular industrial processes and their locations. End-use matching methodology is discussed and first and second law thermodynamics analyses applied to a solar system producing process steam are illustrated. DOE

N80-22849# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
COMMUNICATION STRATEGY TO COMMERCIALIZE PASSIVE SOLAR ENERGY
D. R. Wolcott (Intern. Business Serv., Inc., Washington, D.C.) and F. F. Shoemaker 1979 6 p refs Presented at the Natl. Passive Solar Energy Conf., Kansas City, Mo., 3-5 Oct. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-69-412; CONF-791022-10) Avail: NTIS HC A02/MF A01

Although certain technical and economic issues remain to be clarified, passive solar market development is increasingly dependent upon communications such as information dissemination, education, training and promotional activities. Target audiences are identified as both recipients, and disseminators of passive solar communications. Form and quality of information are discussed in terms of the stages of an innovation adoption decision-making process. Several communication-related barriers which impede the commercialization of passive solar are discussed and general information and education response are suggested. A statement of precepts which should guide passive solar communication programs is also included. DOE

N80-22850# ICF, Inc., Washington, D. C.
ENERGY EXTENSION SERVICE PILOT PROGRAM EVALUATION REPORT: THE FIRST YEAR. VOLUME 2: PILOT STATE REPORTS
Sep. 1979 638 p Prepared in cooperation with Westat Res. Inc., Rockville, Md.
(Contract EY-77-C-01-2671)
(DOE/CS-2671-3) Avail: NTIS HC A99/MF A01

A discussion of the operations of the ten EES pilot-state programs during the period from October 1, 1977 through September 30, 1978 is presented. Each of the ten pilot states, Alabama, Connecticut, Michigan, New Mexico, Pennsylvania, Tennessee, Texas, Washington, Wisconsin, and Wyoming, received a grant to develop and implement a 19 month program. A case study description of the operations of the pilot program in each state is presented with special attention given to the two programs selected in each state for more detailed study and survey research. DOE

N80-22851# Waterloo Univ. (Ontario).
METHODS FOR REDUCING HEAT LOSSES FROM FLAT PLATE SOLAR COOLECTORS, PHASE 3 Final Report, 1 May 1977 - 31 Jan. 1979
K. G. T. Hollands, G. D. Raithby, F. B. Russell, and R. G. Wilkinson Mar. 1979 88 p refs
(Grant EY-76-G-02-2597)
(COO-2597-5) Avail: NTIS HC A05/MF A01

The present study extends earlier studies by examining the effect of the emissivities of both the absorber plate and the glass cover on the honeycomb's ability to suppress free convection, and on the radiative and conductive heat transfer which takes place across the honeycomb in the absence of free conversion. By means of heat transfer measurements on ten Mylar honeycomb, it is shown that the effect of the above emissivities on the suppression of convection by the honeycomb is slight and can probably be ignored. On the other hand, the measurements also showed that the effect of these emissivities on the nonconvective heat transfer is substantial, but not nearly so large as would have been predicted by existing theories. To explain this latter result theories were developed which take into account the important coupling (ignored by previous theories) between the conductive and radiative modes of heat transfer. These new theories predict the measured heat transfer rates to with about +-15%, depending on the emissivities. The results have direct application to evaluating solar collectors which combine a selective surface with a honeycomb. DOE

N80-22852# United Technologies Corp., South Windsor, Conn.
A 300 Btu GAS COMBUSTOR DEVELOPMENT PROGRAM, PHASE 1 Final Report
B. N. Baillif, F. H. Boenig, J. R. Grant (Pratt and Whitney Aircraft, West Palm Beach), and T. E. Holladay (Pratt and Whitney Aircraft,

West Palm Beach) Aug. 1979 100 p refs Prepared jointly with Pratt and Whitney Aircraft, West Palm Beach
(EPRI-AF-1144) Avail: NTIS HC A05/MF A01

Industrial turbines fired on medium heating value (MHV) gas (nominally 300 Btu/scf) synthesized from coal offer an attractive alternative means of producing electrical power in the future. Three MHV gas turbine combustor capable of meeting EPA NO/sub x/ requirements without water injection were designed, fabricated, and tested. Design of the combustion was based on a lean-premix concept. By premixing fuel and air in lean proportions prior to combustion flame temperatures and thus NO/sub x/formation were controlled. Tests were conducted in a single-can combustion rig at simulated engine conditions ranging from 40 to 125% of engine baseload (74 MW). Rig data were analyzed to obtain performance parameters of combustion efficiency, burner pressure loss, and exit temperature pattern factor. Results show that all three combustors meet the NO/sub x/ goal, with connected concentrations of 12 ppmv or less over the range of test conditions. DOE

N80-22853# Oak Ridge National Lab., Tenn.
FOSSIL ENERGY PROGRAM Progress Report, Sep. 1979
Nov. 1979 86 p refs
(Contract W-7405-eng-26)
(ORNL-TM-7095) Avail: NTIS HC A05/MF A01

Research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives to oil and gas as sources of clean energy are summarized. Topics covered include coal conversion development, materials engineering, a coal equipment test program, an atmospheric fluidized bed combustor for cogeneration, engineering studies and technical support, process and program analysis, environmental assessment studies, magnetic beneficiation of dry pulverized coal, technical support to the TVA fluidized bed combustion program, coal cogeneration/district heating plant assessment, chemical research and development, and technical support to major liquefaction projects. DOE

N80-22854# Oak Ridge National Lab., Tenn.
FOSSIL ENERGY PRGORAM Progress Report, Aug. 1979
Oct. 1979 98 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7057; Rept-61) Avail: NTIS HC A05/MF A01

A compendium is presented for monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives to oil and gas as sources of clean energy. The projects reported this month include those for coal conversion development, materials engineering, a coal equipment test program,an atmospheric fluid bed combustor for cogeneration, engineering studies and technical support, process and program analysis, environmental assessment studies, magnetic beneficiation of dry pulverized coal, technical support to the TVA fluid bed combustion program, coal cogeneration/district heating plant assessment, chemical research and development, and technical support to major liquefaction projects. DOE

N80-22855# Oak Ridge National Lab., Tenn.
FOSSIL ENERGY PROGRAM Progress Report, Jul. 1979
Sep. 1979 72 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7031; Rept-60) Avail: NTIS HC A04/MF A01

A compendium is presented of monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives to oil and gas as sources of clean energy. The projects reported include those for coal conversion development, materials engineering, a coal equipment test program, an atmospheric fluid bed combustor for cogeneration, engineering studies and technical support process and program analysis, environmental assessment studies, magnetic beneficiation of dry pulverized coal, technical support to the TVA fluid bed combustion program, coal cogeneration/district heating plant assessment, chemical research and development, and technical support to major liquefaction projects. DOE

N80-22856*# IBM Federal Systems Div., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: SEASONAL REPORT FOR FERN, TUNKHANNOCK, PENNSYLVANIA Contractor Report, May 1978 - Apr. 1979
Jan. 1980 81 p refs Sponsored in part by DOE
(Contract NAS8-32036)
(NASA-CR-161392) Avail: NTIS HC A05/MF A01 CSCL 10A

The operational and thermal performance of a variety of solar systems installed in operational test sites are described. The analysis is based on instrumented system data monitored and collected for at least one full season of operation. The long-term field performance of the installed system is reported, and technical contributions to the definition of techniques and requirements for solar energy system design are made. The solar energy system was designed to supply space heating and domestic hot water for single-family residences. The system consists of air flat plate collectors, storage tank, pumps, heat exchangers, associated plumbing, and controls. F.O.S.

N80-22857# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
DEVELOPMENT AND PREPARATION FOR SERIES PRODUCTION OF A MODULAR SOLAR SPACE HEATING SYSTEM, PHASES 1 AND 2 Final Summary Report
Ruediger Elchlepp, Herbert Grallert, Veit Merges, and Karl-Heinz Ott May 1979 247 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-02) Avail: NTIS HC A11/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 51,45

A modular solar space heating system for residential use at central European latitudes was examined experimentally. Technical as well as economic factors were included. The system selected for the experimental test consisted of flat plate solar collectors and cubic water tanks for energy storage. Two test houses in Germany were equipped with this system, both of them single-family houses. One of these houses is a special, newly constructed prefabricated home, the other was retrofitted with the system. Results are presented. Author (ESA)

N80-22858# Varta Batterie A.G., Kelkheim (West Germany). Forschungs- und Entwicklungszentrum.
GALVANIC CELLS WITH DOPED CaF2 AS A SOLID ELECTROLYTE Final Report
Manfred Koriath and Reinhard Braeutigam Bonn Bundesmin. fuer Forsch. u. Technol. Jun. 1979 67 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-03) Avail: NTIS HC A04/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 13,65

Galvanic cells of the type Ca/CaF2/CuF2 were developed by first producing discharged cells with a thin film technique and later charging them. This method led to cells which showed a very high rate of self discharge. Since cells of this type cannot easily be manufactured in their charged state, it is recommended that further development efforts be discontinued. Author (ESA)

N80-22859# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DEVELOPMENT OF A 5.5 m DIAMETER VERTICAL AXIS WIND TURBINE, PHASE 2 Final Report
Guenter Binder, Albert Fritzsche, Arne Vollan, Anton Dekitsch, Roland Joos, Dieter Welte, Carl-C. Etzler, and Juergen Schmelzle Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1979 138 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-04) Avail: NTIS HC A07/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 28,55

The design work for the turbine, including the aerodynamic and structural dynamic investigations was performed, and the wind turbine built and tested in a wind tunnel. The rotor diameter of 5.5 m is not only a suitable size for the tests, but indicates that the results will contribute to the experimental data required for the design of large converters. The layout of the rotor, the construction methods and choice of materials favor series production, applying advanced mass production technology, without excluding the manufacture in developing countries. The

wind tunnel test performed with the two, three, and four blade version of the Darrieus-rotor and with Savonius-rotors of different heights confirmed the aerodynamic calculations. Possibilities to improve the efficiency of the Savonius-rotor and to simplify some details concerning design and manufacture were evaluated.
Author (ESA)

N80-22860# Stuttgart Univ. (West Germany). Inst. fuer die Technische Nutzung Solarer Energie.
TECHNICAL APPLICATIONS OF SOLAR ENERGY Final Report
Abdelrasouf Arafa, Wolfgang Arndt, and Gerhard Bilger Bonn Bundesmin. fuer Forsch. u. Technol. Jul. 1979 272 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.
(BMFT-FB-T-79-06) Avail: NTIS HC A12/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 56.70

Experimental and theoretical investigations of the conversion of solar energy are presented, including: laboratory investigations with flat plate water collectors; hot water heat storage; development and measurements of selective surfaces; thermoelectric energy conversion; measurements of meteorological and radiation data; data acquisition; outdoor testing of water and air flat plate collectors; and measurement of the energy balance in a solar house. Photovoltaic experiments with flat and concentrating generators, a system study on photovoltaic systems, hybrid flat plate collectors (thermal and photovoltaic), and technology of Cu2S-CaS thin film solar cells are included. The improvement of solar cell use by light conversion with luminiscent substances and time resolved measurement of the global radiation spectrum is also considered. Author (ESA)

N80-22861*# New Mexico Univ., Albuquerque. Technology Application Center.
SOLAR POWER SATELLITES. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE (Progress Report, 1973 - Nov. 1979
Gerald F. Zollars Dec. 1979 88 p Sponsored by NASA and NTIS
(NASA-CR-162931; P880-802697) Avail: NTIS HC A05/MF A01 CSCL 10B

This bibliography of 320 citations to the international literature concerns the development of solar power satellites. The design and construction of the satellite solar arrays and the technology of satellite solar energy conversion and transmission to Earth are the major topics covered. Feasibility analyses of the solar power satellite concept are also included. GRA

N80-22862# Mitre Corp., McLean, Va. METREK Div.
NEW ENGLAND ENERGY DEVELOPMENT SYSTEMS CENTER (NEEDS). AN EXPERIMENT IN UNIVERSITY-INDUSTRY COOPERATIVE RESEARCH. VOLUME 1: SUMMARY OF RESULTS Final Report
Zwi Kohorn Jul. 1979 39 p refs 2 Vol.
(Grant NSF CG-00007)
(P880-112972; MTR-79W00188-Vol-1; NSF/RA-790260) Avail: NTIS HC A03/MF A01 CSCL 10A

The organizational structure, operating mechanism, accomplishments, and lessons of the New England Energy Development Systems (NEEDS) Center are reported. The NEEDS was established as an entity to test the effectiveness of Federal cost sharing in stimulating nonfederal investment in university research, and in facilitating the use of research and development results by industry. Twenty-five individual projects are described and categorized as to performance, source of cost sharing, and total project cost. Accomplishments are discussed with respect to (1) linking private sector organizations with universities, (2) simulating cost-sharing from the private-sector, and (3) facilitating use of results. GRA

N80-22863# Mitre Corp., McLean, Va. METREK Div.
NEW ENGLAND ENERGY DEVELOPMENT SYSTEMS CENTER (NEEDS). AN EXPERIMENT IN UNIVERSITY-INDUSTRY COOPERATIVE RESEARCH. VOLUME 2: CASE HISTORIES Final Report
Zwi Kohorn Jul. 1979 140 p refs 2 Vol.
(Grant NSF CG-00007)
(P880-112980; MTR-79W00188-Vol-2; NSF/RA-790261) Avail: NTIS HC A07/MF A01 CSCL 10A

Case histories of 25 projects involving the New England Energy Development Systems Center as a broker sponsor, and/or research and development (R and D) performer are reported. Projects are grouped into the energy areas of electricity generation, electrical distribution, and reported energy planning. Each case is a self-contained narrative, uniformly structured and sequenced under the following standard headings: project description, problem identification, recruitment, R and D funding, project management, R and D program, information dissemination, evaluation, and references. GRA

N80-22864# National Technical Information Service, Springfield, Va.
SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, Sep. 1977 - Sep. 1978
Audrey S. Hundemann Dec. 1979 99 p
(P880-801707) Avail: NTIS HC $30.00/MF $30.00 CSCL 13A

Design, technical feasibility, performance, and economic factors pertaining to solar heating and cooling of buildings are discussed. Commercial buildings, schools, and residential buildings are covered, with emphasis on the assessment of solar heating and cooling systems for residential buildings. Solar energy as a national energy resource, solar energy research program alternatives, and social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling buildings are included. This updated bibliography contains 90 abstracts, none of which are new entries to the previous edition. GRA

N80-22865# National Technical Information Service, Springfield, Va.
SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Sep. 1977 - Oct. 1979
Audrey S. Hundemann Dec. 1979 153 p Supersedes NTIS/PS-78/1017; NTIS/PS-77/0829; NTIS/PS-76/0728
(P880-801723; NTIS/PS-78/1017; NTIS/PS-77/0829; NTIS/PS-76/0728) Avail: NTIS HC $30.00/MF $30.00 CSCL 13A

Citations from worldwide literature on the use of solar energy to heat and cool buildings are presented, with emphasis on the heating and cooling of residential buildings, and performance simulation studies are cited. Abstracts pertaining to solar assissted heat pump systems and assessment of solar heated Rankine cycle cooling are included. This updated bibliography contains 146 abstracts, 49 of which are new entries to the previous edition. GRA

N80-22866# National Technical Information Service, Springfield, Va.
SOLAR SPACE HEATING AND AIR CONDITIONING, VOLUME 4. CITATIONS FROM THE NTIS DATA BASE Progress Report, Oct. 1978 - Oct. 1979
Audrey S. Hundemann Dec. 1979 235 p Supersedes NTIS/PS-78/1015; NTIS/PS-77/0827; NTIS/PS-76/0727; NTIS/PS-75/689; NTIS/PS-75/345
(P880-801715; NTIS/PS-78/1015; NTIS/PS-77/0827; NTIS/PS-76/0727; NTIS/PS-75/689; NTIS/PS-75/345) Avail: NTIS HC $30.00/MF $30.00 CSCL 13A

Design, technical feasibility, performance, and economic factors pertaining to solar heating and cooling of buildings are discussed. Commercial buildings, schools, and residential buildings are covered, with emphasis on the assessment of solar heating and cooling systems for residential buildings. Solar energy as a national energy resource, solar energy research program alternatives, and social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling buildings are included. This updated bibliography contains 226 abstracts, all of which are new entries to the previous edition. GRA

N80-22867# National Technical Information Service, Springfield, Va.
PASSIVE SOLAR SPACE HEATING AND COOLING.

CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Oct. 1979
Audrey S. Hundemann Dec. 1979 50 p
(PB80-801749) Avail: NTIS HC $30.00/MF $30.00 CSCL 13A

Studies from worldwide literature on the passive solar heating and cooling of buildings are discussed. Abstracts cover design and performance simulation studies of trombe walls and air thermo-siphon solar heating systems. This report contains 45 abstracts. GRA

N80-22868# National Technical Information Service, Springfield, Va.
PASSIVE SOLAR SPACE HEATING AND COOLING. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Oct. 1979
Audrey S. Hundemann Dec. 1979 66 p
(PB80-801731) Avail: NTIS HC $30.00/MF $30.00 CSCL 13A

Design, technical feasibility, performance, and economic factors pertaining to passive solar heating and cooling of buildings are discussed. Abstracts cover trombe walls and air thermo-siphon solar heating systems, comparative economics of passive and active systems, and performance simulation studies. Contains 58 abstracts. GRA

N80-22869# National Technical Information Service, Springfield, Va.
OPTICAL COATINGS FOR SOLAR CELLS AND SOLAR COLLECTORS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report 1970 - Dec. 1979
Brian Carrigan Jan. 1980 230 p Supersedes NTIS/PS-78/1342
(PB80-803794; NTIS/PS-78/1342) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

This bibliography of worldwide journal literature cites reports on materials and research for the development of selective coatings for solar energy conversion devices. These materials include types of coatings or covers used to reflect or transmit solar radiation in order to optimize solar conversion to heat or electricity. Most studies concern antireflection, thermal control, or reflective coatings. Coatings which act as optical filters are also covered. This updated bibliography contains 223 abstracts, 54 of which are new entries to the previous edition. GRA

N80-22870# National Technical Information Service, Springfield, Va.
OPTICAL COATINGS FOR SOLAR CELLS AND SOLAR COLLECTORS, VOLUME 1. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1978
Brian Carrigan Jan. 1980 248 p
(PB80-803778) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Materials and research for the development of selective coatings for solar energy conversion devices are described in these citations. These materials include types of coatings or covers used to reflect or transmit solar radiation in order to optimize solar conversion to heat or electricity. Most studies concern antireflection, thermal control, or reflective coatings. Coatings which act as optical filters are also covered. This updated bibliography contains 241 abstracts, none of which are new entries to the previous edition. GRA

N80-22871# National Technical Information Service, Springfield, Va.
OPTICAL COATINGS FOR SOLAR CELLS AND SOLAR COLLECTORS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1979
Brian Carrigan Jan. 1980 47 p Supersedes NTIS/PS-78/1341; NTIS/PS-77/1036; NTIS/PS-76/0855; NTIS/PS-75/692; NTIS/PS-75/137
(PB80-803786; NTIS/PS-78/1341; NTIS/PS-77/1036; NTIS/PS-76/0855; NTIS/PS-75/692; NTIS/PS-75/137) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

The different development towards selective coating for solar energy conversion devices are described. This includes types of coatings or covers used to reflect or transmit solar radiation in order to optimize solar conversion to heat or electricity. Most studies concern antireflection, thermal control, or reflective coatings. Coatings which act as optical filters are also covered. This updated bibliography contains 40 abstracts, all of which are new entries to the previous edition. GRA

N80-22872# National Technical Information Service, Springfield, Va.
CADIUM SULFIDE SOLAR CELLS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - Nov. 1979
Brian Carrigan Dec. 1979 43 p Supersedes NTIS/PS-78/1213; NTIS/PS-77/7051; NTIS/PS-76/0929; NTIS/PS-75/693 and NTIS/PS-75/089
(PB80-802226; NTIS/PS-78/1213; NTIS/PS-77/1051; NTIS/PS-76/0929; NTIS/PS-75/693; NTIS/PS-75/089) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Citations from Federally-funded research on cadmium sulfide solar cell theory, design, development, fabrication, and degradation are presented. Studies include junctions with thin films of copper sulfide, selenides, and tellurides. The performance, testing, analysis, efficiency, and costs of these cells are covered. This updated bibliography contains 35 abstracts, 22 of which are new entries to the previous edition. GRA

N80-22873# National Technical Information Service, Springfield, Va.
CADMIUM SULFIDE SOLAR CELLS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
Brian Carrigan Dec. 1979 233 p Supersedes NTIS/PS-78/1214; NTIS/PS-77/1052 and NTIS/PS-76/0930
(PB80-802234; NTIS/PS-78/1214; NTIS/PS-77/1052; NTIS/PS-76/0930) Avail: NTIS HC $30.00/MF $30.00 CSCL 10B

Worldwide research on cadmium sulfide solar cell design, development, fabrication, heterojunctions, doping, and performance are cited in this bibliography. Studies on defects, protective coatings, and arrays are included. Thin films of copper indium selenide, copper sulfide, indium phosphide, cadmium selenides, and cadmium tellurides are among those described in these photovoltaic systems. This updated bibliography contains 227 abstracts, 55 of which are new entries to the previous edition. GRA

N80-22874# Scientific Process and Research, Inc., Highland Park, N. J.
LOWERING OF ENERGY CONSUMPTION IN PLASTICS PROCESSING Progress Report, 1 Oct. 1977 - 31 Mar. 1978
Imrich Klein, Reuben Klein, and D. W. Riley 3 Apr. 1978 243 p
(Grant NSF APR-77-19512)
(PB-281113/1; SPR/NS-78/01) Avail: NTIS HC A11/MF A01 CSCL 11I

The objective of this research is to explore the potentials of a new plastics processing device-the Recycle Screw-to lower energy consumption and to improve the overall efficiency of the plastics extrusion process. The method used to conduct the research was a large scale computer based investigation employing SPR's computerized physical model of the plasticating extruder, EXTRUD*, and SPR's Data Bank of processing properties of plastics. Close to 1700 simulations were performed using physical properties representing 17 different resin grades covering the most widely used families of polymers. The study extended over 5 different extruder sizes and shows that the Recycle Screw offers the following features: (1) lower extrudate temperature of up to 200 degrees F.; (2) drastically lower requirements of costly heat stabilizers; (3) lower cooling load and cooling water requirements; (4) lower scrap production by generating higher quality-low temperature extrudate; (5) considerable increases in production rate on existing processing machinery; (6) decrease in capital investment by utilization of smaller cooling lines and associated plant facilities. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-22875*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE RELATIVE IMPORTANCE OF NOISE LEVEL AND NUMBER OF EVENTS ON HUMAN REACTIONS TO NOISE: COMMUNITY SURVEY FINDINGS AND STUDY METHODS
James M. Fields Mar. 1980 25 p refs Presented at 98th Acoustical Soc. of Am. Meeting, Salt Lake City, Utah, 26-30 Nov. 1979
(NASA-TM-81795) Avail: NTIS HC A02/MF A01 CSCL 13B

The data from seven surveys of community response to environmental noise are reanalyzed to assess the relative influence of peak noise levels and the numbers of noise events on human response. The surveys do not agree on the value of the tradeoff between the effects of noise level and numbers of events. The value of the tradeoff cannot be confidently specified in any survey because the tradeoff estimate may have a large standard error of estimate and because the tradeoff estimate may be seriously biased by unknown noise measurement errors. Some evidence suggests a decrease in annoyance with very high numbers of noise events but this evidence is not strong enough to lead to the rejection of the conventionally accepted assumption that annoyance is related to a log transformation of the number of noise events. Author

N80-22876# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN: MAGNETOHYDRODYNAMICS
May 1979 199 p refs
(DOE/EDP-0045) Avail: NTIS HC A09/MF A01

The updated environmental development plan (EDP) for DOE's magnetohydrodynamics (MHD) program is presented. A brief summary of the environmental concerns identified in the original MHD EDP is given. MHD technology and DOE's MHD program are described and environmental concerns are identified. The environmental concerns associated with MHD are addressed and resolved are tabulated. An environmental concerns is developed. DOE

N80-22877# Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.
COOLING TOWER RECIRCULATION AS INFLUENCED BY THE LOCAL ATMOSPHERIC FLOW FIELD, A NUMERICAL MODEL
Bryan R. Becker (The Univ. of Tennessee Space Inst., Tullahoma) and Walter Frost 1979 35 p refs Presented at the ASMG winter annual meeting New York, Dec. 1979
(Contract W-7405-eng-26)
(K/CSD/INF-79/6; CONF-791205-7) Avail: NTIS HC A03/MF A01

Cooling tower performance is adversely affected by the recirculation of stack effluent back into the tower intake louvers. A unique method of numerically modeling cooling tower plume recirculation is described. The structure of the wake region behind the tower is resolved using the equations of hydrodynamics. The flow field within the tower is modeled as porous media flow. Interior and exterior flow fields are coupled by matching pressures and flow rates at the intake louvers. DOE

N80-22878# Exxon Nuclear Idaho Co., Inc., Idaho Falls.
LOW-LEVEL AIRBORNE MONITORING TECHNIQUES UTILIZED IN A FIELD MEASUREMENT PROGRAM AT OPERATING PRESSURIZED WATER REACTORS
D. W. Akers, N. K. Bihl, S. W. Duce, J. W. Tkachyk, and B. G. Motes 1979 14 p Presented at the 23rd Conf. on Anal. Chem. in Energy Technol., Gatlinburg, Tenn., 9 Oct. 1979
(Contract EY-76-C-07-1570)
(CONF-791049-8) Avail: NTIS HC A02/MF A01

An in-plant measurement program underway at commercial nuclear power stations is described. Measurements were made of low level airborne radioactivity concentrations and release rates. A discussion of the measurement methods is given. The monitoring methods discussed include several types of radioiodine species samplers in addition to an atmospheric C-14 and tritium sampler. Each method is individually evaluated with emphasis upon: system description, observed detection limits, sample preparation, analysis, problems encountered in field use, and appropriate usage in a nuclear power plant ventilation system. DOE

N80-22879# Oak Ridge National Lab., Tenn.
ENVIRONMENTAL IMPACTS OF FOREST FERTILIZATION ON TERRESTRIAL ECOSYSTEMS
Dale W. Johnson 1979 26 p refs Presented at the Conf. on Forest Fertilization, Shelton, W. Va., 25 Sep. 1979
(Contract W-7405-eng-26)
(CONF-790980-1) Avail: NTIS HC A03/MF A01

Side effects such as improved tree resistance to damage by air pollution and insect and disease attack are examined. The possibilities for managing mycorrhizal communities by fertilization and the effects of excessive nitrification are also discussed. While the prospects for managing mycorrhizal activity as well as controlling insect and disease outbreaks by fertilization are appealing, long-term ecological studies of forest fertilization effects on these as well as other ecosystem components will be necessary before these goals can be achieved. DOE

N80-22880# Oak Ridge National Lab., Tenn. Environmental Science Div.
GLOBAL STABILITY IN ECOLOGICAL MODELS WITH CONTINUOUS TIME DELAYS
W. M. Post (Tennessee Univ., Knoxville) and C. C. Travis 1979 14 p refs Presented at the Functional Differential and Integral Equations Conf., Morgantown, W. Va., 18 Jun. 1979
(Contract W-7405-eng-26)
(CONF-7906102-2) Avail: NTIS HC A02/MF A01

The stability properties of a general system of first-order integro-differential equations which describe the dynamics of interacting species populations are examined. A sufficient condition for the global stability of an equilibrium state is derived. This condition has intuitive biological interpretations and is verifiable in a finite number of arithmetical steps. This condition is shown to be both necessary and sufficient for global asymptotic stability of the equilibrium for communities of mutualistically interacting species. Application of the results to an ecological system is also provided. DOE

N80-22881# California Univ., Berkeley. Lawrence Berkeley Lab.
INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: BIOMEDICAL
May 1979 301 p refs
(Contract W-7405-eng-48)
(LBL-1-Vol-4) Avail: NTIS HC A14/MF A01

An update is presented on instruments useful for measurements in biomedicine related to environmental research and monitoring. Descriptions of the physical and operating characteristics of available instruments, critical comparisons among instrumentation methods, and recommendations of promising methodology and development of new instrumentation are given. Methods of detection and analysis of gaseous organic pollutants and metals, including Ni and As, are presented. Instrument techniques and notes are included on atomic spectrometry and UV and visible absorption instrumentation. DOE

N80-22882# Los Alamos Scientific Lab., N. Mex.
NATIONAL IMPACTS ON VISUAL AIR QUALITY FROM A FUTURE ENERGY SCENARIO
D. Nochumson, M. Wecksung, and G. Gurule 1979 11 p refs Presented at ACPA Conf. on Visibility, Denver, 26 Nov. 1979
(Contract W-7405-eng-36)
(LA-UR-79-3214; CONF-791139-1) Avail: NTIS HC A02/MF A01

A methodology was developed to evaluate impacts on atmospheric visual air quality for nonurban areas caused by regional haze. Estimated values of median visual range for 39 nonurban ambient air quality monitoring sites were shown to have a high correlation with observed values. A decline in median visual range is projected in regions of the west and the Gulf Coast where there is a substantial growth in the combustion of

sulfur containing fossil fuels--coal in particular. The projected decline in median visual range in mandatory Class One Federal areas, particularly in the Western US, may conflict with Congress's goal of protecting these areas against visibility impairment. Regulations for defining visibility impairment remain to be defined. The meeting of the emission limitations of the state implementation plans is projected to significantly improve the low visibilities experienced in the Eastern US, particularly in the Ohio Valley and the surrounding region. DOE

N80-22883# Battelle Pacific Northwest Labs., Richland, Wash.
USE OF RECONNAISSANCE LEVEL INFORMATION FOR ENVIRONMENTAL ASSESSMENT
R. F. Foster, W. H. Rickard, J. A. Strand, and M. L. Warner Nov. 1979 46 p
(Contract EY-76-C-06-1830)
(NUREG-CR-0990; PNL-3080) Avail: NTIS HC A03/MF A01

Reconnaissance level inforamtion (RLI) sufficient for comparing the environmental and socio-economic features of candidate sites for nuclear power stations and for guiding plant design, baseline surveys, and operational practices is discussed. Environmental concerns of special importance for site evaluation include: aquatic ecology, terrestrial ecology, land and water use, socioeconomics, and institutional constraints. A scheme is suggested for using RLI to assign classifications to candidate sites based on the potential level of concern associated with the different environmental features. DOE

N80-22884# Los Alamos Scientific Lab., N. Mex.
FIBROUS AEROSOL STUDIES
L. W. Ortiz, M. I. Tillery, H. J. Ettinger, and J. I. Martinez Nov. 1979 45 p refs Sponsored in part by National Institute for Occupational Safety and Health
(Contract W-7405-eng-36)
(LA-8119-MS) Avail: NTIS HC A03/MF A01

Glass and asbestos fibers are discussed in terms of occupational safety and public health. Aerosol generation, aerodynamic size characterization, and sampler evaluation are among the topics studied. Several related subtopics on microscopy and asbestos are included. DOE

N80-22885# Greater London Council (England).
AIR POLLUTION AND PEDESTRIANIZATION: STUDIES AT THE UPPER NORWORD TRIANGLE. THE WESTOW HILL TRAFFIC EXPERIMENT
R. B. Sainsbury and R. Caswell 1977 30 p refs
(RM-496; ISBN-0306-7203) Avail: NTIS HC A03/MF A01; Greater London Council, London £2.30

Carbon monoxide, smoke, and lead concentrations were measured in the air of an urban area before and during a six month period when the area was closed to automobile traffic. Pollution levels were lower in the test area, but increased on the periphery. The measurement techniques are discussed and the reduced data presented. Author (ESA)

N80-22886# Research Inst. for Environmental Hygiene, TNO, Delft (Netherlands). Atmospheric Pollution Div.
LEAD, ITS SOURCES, DISPERSION AND ITS RELATION TO CO
A. L. Aggarwal Jan. 1979 42 p refs
(IG-TNO-G-770) Avail: NTIS HC A03/MF A01

Literature concerning the contribution of gasoline combustion to lead concentrations in the atmosphere is surveyed, and discussed in relation to lead pollution levels in the Netherlands. Lead concentration data are presented, with attempts made to correlate concentrations with season, traffic density, wind direction and speed, atmospheric stability, and background levels of lead. Simultaneous measurements for CO and Pb show a strong dependence of the Pb/CO relationship on season. Author (ESA)

N80-22887# Systems Applications, Inc., San Rafael, Calif.
PROCEDURES FOR EVALUATING THE PERFORMANCE OF AIR QUALITY SIMULATION MODELS
M. J. Hillyer, S. D. Reynolds, and P. M. Roth Oct. 1979 155 p refs
(Contract EPA-68-02-2593)
(PB80-125206; EPA-450/4-79-033) Avail: NTIS HC A08/MF A01 CSCL 13B

A procedural framework for objectively evaluating model performance was developed. Previous model evaluation studies are reviewed. Gaps in present knowledge that limit model evaluation are identified. GRA

N80-22888# Research Triangle Inst., Research Triangle Park, N. C.
PROCEEDINGS: SYMPOSIUM ON FLUE GAS DESULFURIZATION, VOLUME 1
Franklin A. Ayer, comp. Mar. 1979 638 p refs Proc. held at Las Vegas, Nev. 5-8 Mar. 1979
(Contract EPA-68-02-2612)
(PB80-133168; EPA-600/7-79-167A) Avail: NTIS HC A99/MF A01 CSCL 13B

Contents: overview of control technology-the bridge between energy utilization and environmental goals; health effects of SO2 and sulfates; energy, environmental, and economic impacts of flue gas desulfurization under alternative new source performance standards; status of development, energy and economic aspects of alternative technologies; economic and energy requirements of sulfur oxides control processes; combined coal cleaning and FGD; the interagency flue gas desulfurization evaluation study; status of flue gas desulfurization in the United States; recent results from EPA's lime/limestone scrubbing programs; compliance programs for SO2 emission; and SO2 and NOx removal technology in Japan. GRA

N80-22889# Research Triangle Inst., Research Triangle Park, N. C.
PROCEEDINGS: SYMPOSIUM ON FLUE GAS DESULFURIZATION, VOLUME 2
Franklin A. Ayer Mar. 1979 631 p refs Symp. held at Las Vegas, Nev., 5-8 Mar. 1979
(Contract EPA-68-02-2612)
(PB80-133176; EPA-600/7-79-167B) Avail: NTIS HC A99/MF A01 CSCL 13B

Contents: utility conventional combustion comparative environmental assessment - coal and oil; design and commercial operation of lime/limestone FGD sludge stabilization systems; power plant flue gas desulfurization using alkaline fly ash from western coals; environmental effects of FGD disposal - a laboratory/field landfill demonstration; summary of utility dual alkali system; the FGD reagent dilemma - lime, limestone, or thiosorbic lime; The status of industrial boiler FGD applications in the United States; status of the project to develop standards of performance for industrial fossil-fuel-fired boilers; and flue gas desulfurization applications to industrial boilers. GRA

N80-22890# Research Triangle Inst., Research Triangle Park, N. C.
OXIDANT-PRECURSOR RELATIONSHIPS UNDER POLLUTANT TRANSPORT CONDITIONS. OUTDOOR SMOG CHAMBER STUDY, VOLUME 1 Final Report, Jun. 1975 - Jun. 1978
J. E. Sickles, II, L. A. Ripperton, W. C. Eaton, and R. S. Wright Aug. 1979 125 p refs Prepared for Environmental Sciences Research Lab.
(Contract EPA-68-02-2207)
(PB80-109127; EPA-600/3-79-078A-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 04A

Multiple-day experiments were conducted in outdoor smog chambers to investigate the influence of simulated transport on ozone generation by various combinations of a surrogate urban hydrocarbon mixture and nitrogen oxides. The simulation of transport was accomplished by progressively diluting the contents of the chambers with purified air. Additional experiments were conducted to examine the ozone-generative potential of low reactivity hydrocarbons, to provide data for testing and validation of a computer-based photochemical simulation model, and to compare the behavior of two types of outdoor smog chambers. GRA

N80-22891# Research Triangle Inst., Research Triangle Park, N. C.
OXIDANT-PRECURSOR RELATIONSHIPS UNDER POLLUTANT TRANSPORT CONDITIONS. OUTDOOR SMOG CHAMBER STUDY. VOLUME 2: APPENDIXES Final Report,

Jun. 1975 - Jun. 1978
J. E. Sickles, II, L. A. Ripperton, W. C. Eaton, and R. S. Wright Aug. 1979 435 p Prepared for Environmental Sciences Research Lab.
(Contract EPA-68-02-2207)
(PB80-109135; EPA-600/3-79-078B-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 04A

Multiple-day experiments were conducted in outdoor smog chambers to investigate the influence of simulated transport on ozone generation by various combinations of a surrogate urban hydrocarbon mixture and nitrogen oxides. The simulation of transport was accomplished by progressively diluting the contents of the chambers with purified air. Smog chamber analytical data for hydrocarbons, NO, O3, CO, CH2O, and condensation nuclei as well as dilution and meteorological data, are presented in tabular form. GRA

N80-22892# Woodard-Clyde Consultants, San Francisco, Calif.
MANUAL OF PRACTICE FOR PROTECTION AND CLEANUP OF SHORELINES. VOLUME 1: DECISION GUIDE Final Report, Apr. - Jul. 1979
Carl R. Foget, Eric Schrier, Martin Cramer, and Robert Castle Aug. 1979 124 p 2 Vol.
(Contract EPA-68-03-2542)
(PB80-108830; EPA-600/7-79-187A-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 13B

A systematic, easy to apply methodology that can be used to assess the threat of an oil spill and select the most appropriate protection and cleanup techniques is presented. A detailed discussion of the factors involved in the decision-making process is given and includes oil characteristics, behavior and movement of oil, shoreline characterization and sensitivity, protection and cleanup priorities and implementation requirements, and impacts associated with cleanup operations. GRA

N80-22893# Woodard-Clyde Consultants, San Francisco, Calif.
MANUAL OF PRACTICE FOR PROTECTION AND CLEANUP OF SHORELINES. VOLUME 2: IMPLEMENTATION GUIDE Final Report, Apr. - Jul. 1979
Carl R. Foget, Eric Schrier, Martin Cramer, and Robert Castle Aug. 1979 137 p 2 Vol.
(Contract EPA-68-03-2542)
(PB80-108848; EPA-600/7-79-187B) Avail: NTIS HC A07/MF A01 CSCL 13B

Information required for the implementation of an effective response to an oil spill is considered. Specifically, information sources of oil spills and shoreline data are cited. Oil characteristics, behavior and movement of oil, shoreline characterization and sensitivity, protection and cleanup priorities and implementation requirements, and impacts associated with cleanup operations are included. GRA

N80-22894# SRI International Corp., Menlo Park, Calif.
SURVEY OF THE ROLE OF NOx IN NONURBAN OZONE FORMATION Final Report
J. R. Martinez and H. B. Singh Sep. 1979 156 p refs
(Contract EPA-68-02-2835)
(PB80-122815; EPA-450/4-79) Avail: NTIS HC A08/MF A01 CSCL 04A

The role of oxides of nitrogen (NOx) in the formation of ozone (O3) in nonurban areas is summarized. A literature review, a survey of expert opinion, and analyses of field data are included. The results show that present knowledge about NOx/O3 interactions in nonurban areas is fragmentary, and that there is no direct quantitative description of the link between urban NOx and nonurban O3. A preliminary analysis of nine rural and suburban sites indicates that transport is the principal mechanism associated with ozone levels that exceed 100 ppb. The analysis further suggests that transport times of the order of six to eight hours are most likely to be associated with the high ozone observed at these sites. GRA

N80-22895# Battelle Columbus Labs., Ohio.
CRITERIA FOR ASSESSMENT OF ENVIRONMENTAL POLLUTANTS FROM COAL CLEANING PROCESSES Final Report, Sep. 1978 - Apr. 1979
R. A. Ewing, B. W. Cornaby, P. VanVoris, J. C. Zuck, and G. E. Raines 1979 202 p refs
(Contract EPA-68-02-2163)
(PB80-102791; EPA-600/7-79-140) Avail: NTIS HC A10/MF A01 CSCL 06F

The development of criteria for assessing environmental pollutants associated with coal cleaning processes is described. The major criterion for ranking the importance of any pollutant is the relationship between its expected environmental concentration and the maximum concentration which presents no long-term hazard to humans or biota. Environmental concentrations depend on emission rates and the effects of physical transport and dispersion. GRA

N80-22896# Franklin Research Center, Philadelphia, Pa. Science Information Services Organization.
INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: ETHYLENE GLYCOL, PROPYLENE GLYCOLS AND BUTYLENE GLYCOLS Final Report
Lynne M. Miller 7 Mar. 1980 270 p refs
(Contract EPA-68-01-3893)
(PB80-109119; EPA-560/11-79-006) Avail: NTIS HC A12/MF A01 CSCL 06F

Aspects of production, use, environmental exposure and biological effects of ethylene glycol, two isomers of propylene glycol (1,2-and 1,3-propanediol) and four isomers of butylene glycol (1,3- 1,4-, 2,3-, and 1,2-butanediol) are reviewed. The major source of environmental contamination by ethylene glycol and 1,2-propanediol is likely from the disposal of spent antifreeze and deicing fluids. However, limited monitoring data make it difficult to adequately assess environmental exposure to the glycols. The glycols are capable of being degraded by a variety of acclimated and unacclimated soil, water, and sewage microorganisms. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-22897 Florida State Univ., Tallahassee.
RELATIVISTIC GRAVITATION AND THE LARGE NUMBERS HYPOTHESIS Ph.D. Thesis
Roger Keith Parsons 1979 74 p
Avail: Univ. Microfilms Order No. 8008618

Dirac's modification of the Schwarzschild geometry is studied. This geometry represents the gravitational field of a point mass in a universe that expands in accordance with the large numbers hypothesis. It is shown that this geometry should be extended to include a region isometric to the Schwarzschild interior geometry and that free particles can enter this region in a finite proper time. Equations to determine the geometry for more general distributions of matter are proposed. It is shown that these equations are consistent with the large numbers hypothesis provided the interaction of the gravitational field with the spin one half particles in the universe is taken into account. Dissert. Abstr.

N80-22898 California Univ., Irvine.
A LABORATORY TEST OF THE INVERSE SQUARE LAW OF GRAVITY Ph.D. Thesis
Robert Evan Spero 1980 139 p
Avail: Univ. Microfilms Order No. 8008450

A laboratory test of the inverse square law of gravity was conducted. The almost null field inside a long precisely machined tube was probed by a test mass suspended from a torsion balance. In terms of a distance dependent gravitational constant G(r), the experiment is sensitive to variations in G(r) over the distance range of approximately 2 to 5 cm. Dissert. Abstr.

N80-22899 Northwestern Univ., Evanston, Ill.
THE RELATIONSHIP BETWEEN SEISMICITY AND CRUSTAL STRUCTURE IN THE WESTERN GREAT BASIN Ph.D. Thesis
Allen Hughes Cogbill, Jr. 1979 294 p
Avail: Univ. Microfilms Order No. 8007361

The possible relationships between the Nevada seismic zone and the anomalous seismicity and the crustal and upper mantle structure of the western Great Basin are examined. The data used are 16,629 gravity observations in the western Great Basin and relative teleseismic P wave delays measured by a local network near Mina, Nevada. The velocities inferred from the seismic refraction studies are converted to densities using newly derived density velocity relations for crustal rocks. Using crustal thicknesses and velocities inferred from refraction profiles as constraints, P wave delays and gravity anomalies in the Excelsior Mountains Region were used to infer that a zone of partially melted crustal or upper mantle material underlies the southwestern part of the region. Low wavenumber free air and Bouguer anomalies were compared to the corresponding low wavenumber topography to infer the isostatic balance of the western Great Basin. Dissert. Abstr.

N80-22900 State Univ. of New York at Stony Brook.
TOTAL NITROGEN CONTENT OF DEEP SEA BASALTS, WITH IMPLICATIONS FOR THE ORIGIN OF THE EARTH'S ATMOSPHERE Ph.D. Thesis
Thomas Lee Norris 1979 141 p
Avail: Univ. Microfilms Order No. 8009604

Various models have been suggested concerning the origin and evolution of the earth's atmosphere. An estimate of the nitrogen content of the mantle could further constrain atmospheric models. A variety of deep sea basalt glass and matrix and two USGS standard rock powders were studied. Total nitrogen content was determined by thermal neutron activation analysis via 14N(n,p)14C. The 14C was converted to carbon dioxide and counted in miniature low level proportional counters. The USGS standards do not give consistent nitrogen abundances between different laboratories. The abundances determined in this study were also not reproducible with other studies. The total nitrogen content from this work was G-2 with 44 + or - 4 ppm N and BCR-1 with 77 + or - 9 ppm N. 14C low temperature release patterns indicate these samples contain at least 30 percent of the total nitrogen bound near the surface. Dissert. Abstr.

N80-22901 Michigan Univ., Ann Arbor.
THE EVOLUTION OF OXYGEN AND OZONE IN THE EARTH'S ATMOSPHERE Ph.D. Thesis
James Fraser Kasting 1979 269 p
Avail: Univ. Microfilms Order No. 8007765

A one dimensional coupled flow photochemical model was used to examine different stages in the evolution of the terrestrial atmosphere. The amount of oxygen pressed in the prebiological atmosphere was calculated as a function of the volcanic outgassing rates of hydrogen and carbon monoxide and the rate of oxidation of the Earth's crust. The possibility that enhanced carbon dioxide levels may have kept the Earth's surface temperature above freezing in the face of decreased solar luminosity is discussed. Dissert. Abstr.

N80-22902 Princeton Univ., N. J.
THE CANONICAL FORMULATION OF SUPERGRAVITY AND THE QUANTIZATION OF THE ULTRALOCAL THEORY OF GRAVITY Ph.D. Thesis
Martin Lee Pilati 1979 125 p
Avail: Univ. Microfilms Order No. 8008567

The canonical formulation of supergravity and other geometrical, supersymmetric theories, are discussed. The Hamiltonian for supergravity and the spinning membrane are computed, and the possible usefulness of the Hamiltonian formalism for finding the underlying geometry is described. The quantization of the ultralocal theory of gravity is discussed. Dissert. Abstr.

N80-22903 California Univ., Los Angeles.
THE SCAVENGING OF ATMOSPHERIC TRACE GASES BY CLOUD DROPS AND SMALL RAINDROPS Ph.D. Thesis
Lal B. Baboolal 1979 227 p
Avail: Univ. Microfilms Order No. 8008456

The rate at which trace gases are removed from the atmosphere by falling cloud drops and small rain drops was investigated. The convective diffusion equation was solved for a trace gas diffusion through the atmosphere, onto and then into an initially solute free liquid drop falling at constant terminal velocity. Drops considered were of radii 8.6, 70.8, 142.3 and 305.5 micrometers. The convective diffusion equation was solved for zero flow, for the case of diffusion superimposed by Hadamard-Rybczynski flow inside the drop (HR-flow), and for the case of diffusion superimposed by the numerical solution to the complete Navier-Stokes equation of motion for incompressible flow. Dissert. Abstr.

N80-22904 Illinois Univ. at Urbana-Champaign.
WIND AND WAVE OBSERVATIONS IN THE MESOSPHERE USING COHERENT-SCATTER RADAR Ph.D. Thesis
Ian Douglas Countryman 1979 149 p
Avail: Univ. Microfilms Order No. 8009008

Measurements of backscattered signals from the mesosphere using the coherent scatter technique are reported. The multiheight, multidirectional wind measurements indicate that short period vertical velocity oscillations are usually evanescent vertically although propagating, reflected (trapped) modes are observed. Short period horizontal velocity oscillations are not consistently strong enough to be measurable for the pointing directions used. Tidal period horizontal winds are variable in amplitude and do not match theoretical predictions regarding uniform growth with height. Dissert. Abstr.

N80-22905 Oklahoma Univ., Norman.
MESOSCALE GRAVITY WAVES AS A POSSIBLE TRIGGER OF SEVERE CONVECTION ALONG A DRYLINE Ph.D. Thesis
Steven Edward Koch 1979 212 p
Avail: Univ. Microfilms Order No. 8008650

Perturbations in the surface moisture convergence field in the mesoscale environment along a dryline are shown to be manifestations of a wavelike mechanism responsible for triggering each of 11 severe storms. Mesonetwork data were analyzed and the following wave characteristics: horizontal phase speed C sub p = 22 m/s, median wavelength of 22 km, and mean periodicity of 17 min are discussed. Several hypotheses from classical hydrodynamic instability theory are considered as plausible explanations for the mesoscale disturbance. A cross spectral analysis of the data confirms the mesoanalytical estimates of the wave characteristics, and shows the waves to be confined to a region within 20 km of the dryline. Dissert. Abstr.

N80-22906 Utah Univ., Salt Lake City.
TOPOGRAPHICALLY INDUCED DIURNAL BOUNDARY LAYER OSCILLATIONS: TWO DIMENSIONAL SYNOPTIC SCALE MODELING Ph.D. Thesis
David Wilton McLawhorn 1979 185 p
Avail: Univ. Microfilms Order No. 8008411

A two dimensional boundary layer model is developed for the study of diurnal cycles in boundary layer convergence over synoptic scale sloping terrain and thermally inhomogeneous surfaces. To properly resolve the terrain configuration, a local terrain following coordinate system is developed. The local coordinate system has characteristics which are superior to the terrain following coordinate systems commonly used. Truncation errors are significantly reduced in the local system so variations in the flow field due to physical forcing are easily discernible from those due to truncation error. The model exhibits a sensitivity to lattitude though it is apparently not very sensitive to radiative flux divergence calculations. Dissert. Abstr.

N80-22907*# Old Dominion Univ. Research Foundation, Norfolk, Va.
THE CONTRIBUTION OF MOLECULAR RELAXATION IN NITROGEN TO THE ABSORPTION OF SOUND IN THE ATMOSPHERE Final Report
Allan J. Zuckerwar and Roger W. Meredith Apr. 1980 18 p refs
(Contract NsG-1324)
(NASA-CR-162928; PTR-80-4) Avail: NTIS HC A02/MF A01 CSCL 04A

Results and statistical analysis are presented for sound absorption in N2-H2O binary mixtures at room temperature. Experimental procedure, temperature effects, and preliminary results are presented for sound absorption in N2-H2O binary mixtures at elevated temperatures. E.D.K.

N80-22908*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
EARTH RADIATION BUDGET MEASUREMENTS FROM SATELLITES AND THEIR INTERPRETATION FOR CLIMATE MODELING AND STUDIES
Thomas H. VonderHaar, G. L. Stephens, and G. G. Campbell Apr. 1980 58 p refs
(Contract NAS1-15553)
(NASA-CR-159232) Avail: NTIS HC A04/MF A01 CSCL 04A

The annual and seasonal averaged Earth atmosphere radiation budgets derived from the most complete set of satellite observations available are presented. The budgets were derived from a composite of 48 monthly mean radiation budget maps. Annually and seasonally averaged radiation budgets are presented as global averages and zonal averages. The geographic distribution of the various radiation budget quantities is described. The annual cycle of the radiation budget was analyzed and the annual variability of net flux was shown to be largely dominated by the regular semi and annual cycles forced by external Earth-Sun geometry variations. Radiative transfer calculations were compared to the observed budget quantities and surface budgets were additionally computed with particular emphasis on discrepancies that exist between the present computations and previous surface budget estimates. R.E.S.

N80-22909# Purdue Univ., Lafayette, Ind. Dept. of Mathematical Sciences.
LATERAL BOUNDARY CONDITIONS FOR QUASISTEADY ATMOSPHERIC FLOWS Progress Report, 1 Jul. - 31 Dec. 1979
Paul Gordon 21 Dec. 1979 61 p refs
(Contract N00014-78-C-0308; NR Proj. 061-254)
(AD-A080199) Avail: NTIS HC A04/MF A01 CSCL 20/4

The quasisteady model is extended to include lateral boundary conditions. The approach is to first assume a well-posed complete time-dependent problem, including boundary conditions; it is stressed that to each boundary condition there should be associated a precise physical assumption. It is then shown that the quasisteady assumption can be applied consistently to both the partial differential equations and the boundary conditions, thereby obtaining a well-posed mathematical model with time scales suitable for large scale atmospheric flows. Three types of conditions are considered at the lateral boundaries: (1) outflow, (2) inflow (driven) velocity is specified and is essentially independent of the internal flow, (3) inflow (passive) - inflow is created primarily by the internal flow configuration. The upper boundary conditions include the two derived in an earlier paper, the continuous and discontinous boundary conditions, and a third condition, which is designed to allow the flow to propagate independently of the height of the region. Numerical solutions are obtained for various test cases, and convergence of the calculations is demonstrated. One sees that, although the calculations are reasonable, both from a mathematical and physical standpoint, the various calculations differ from each other very significantly, both qualitatively and quantitatively. It is suggested, therefore, that the process of specifying and evaluating boundary conditions will proceed more efficiently if more physical understanding is obtained in regard to relatively simple flows, such as a wave entering a stationary flow at a lateral boundary. GRA

N80-22910# SRI International Corp., Menlo Park, Calif.
ON THE SPATIAL RELATIONSHIP OF 1-METER EQUATORIAL SPREAD-F IRREGULARITIES AND PLASMA BUBBLES Topical Report, 15 Feb. - 1 Apr. 1979
Roland T. Tsunoda Apr. 1979 31 p refs
(Contract DNA001-79-C-0153; DNA Proj. I25AAXH)
(AD-A080549; DNA-4935T; AD-E300658; TP-2) Avail: NTIS HC A03/MF A01 CSCL 04/1

A radar experiment was conducted on 18 August 1978 at Kwajalein Atoll, Marshall Islands, to investigate the spatial relationship of 1 m equatorial spread-F irregularities to plasma bubbles (localized depletions in F-layer plasma density). East-west scans were made with ALTAIR, an incoherent-scatter radar, to spatially map (1) the backscatter produced by field-aligned irregularities, and (2) the electron-density distribution of the background F layer. Plasma bubbles were spatially mapped for the first time with an incoherent-scatter radar. By assuming invariance along the magnetic field lines (over distances of less than 100 km), we show that 1 m field-aligned irregularities are directly related to plasma bubbles. GRA

N80-22911# Hycor, Inc., Woburn, Mass.
HIGH ALTITUDE SMOKE PROGRAM (HASP-2) Final Report, 30 Apr. - 30 Sep. 1979
L. James Larson 26 Oct. 1979 14 p
(Contract F19628-79-C-0028; AF Proj. 6687)
(AD-A080964; AFGL-TR-79-0252) Avail: NTIS HC A02/MF A01 CSCL 19/1

A dispenser previously developed for high altitude (85,000 ft) release of smoke puffs in support of stratospheric turbulence studies was modified to incorporate direct thermal input to each launch tube. The modified dispenser was environmentally and functionally tested prior to delivery to Holloman AFB, N.M. for balloon test. The dispenser ejects six (6) smoke puff canisters containing equal weights of TiCl4 and a 50/50 water-methanol mixture. GRA

N80-22912# California Univ., Livermore. Lawrence Livermore Lab.
SOURCES AND SINKS OF STRATOSPHERIC WATER VAPOR
H. W. Ellsaesser Nov. 1979 19 p refs Presented at NATO Advanced Study Inst. on Stratospheric Ozone, Aldeia das Acoteias, Algarve, Albufeira, Portugal 1-13 Oct. 1979
(Contract W-7405-eng-48)
(UCRL-83611) Avail: NTIS HC A02/MF A01

A tutorial review of the understanding of stratospheric H2O and the processes controlling it is presented. Paradoxes posed by currently available observational data are cited and suggestions made as to how they might be resolved. Such resolution appears to require that the bulk of our current data provides unrepresentative and misleading vertical and latitudinal H2O gradients immediately downstream from the tropical tropopause, and that there exists within the troposphere a mechanism different from or in addition to the tropical tropopause cold trap for driving air to the mixing ratios found in the lower stratosphere. Satisfaction of these requirements will reconcile much heretofore puzzling observational data and will obviate the necessity for a stratospheric sink for H2O. DOE

N80-22913# Atomic Weapons Research Establishment, Aldermaston (England).
EARTHQUAKE FOCAL MECHANICS FROM RELATIVE AMPLITUDES OF P, pP AND sP: METHODS AND COMPUTER PROGRAM
R. G. Pearce London HMSO Aug. 1979 106 p refs
(AWRE-O-41/79; BR69944; ISBN-0-85518133-8) Avail: NTIS HC A06/MF A01; HMSO £2.50 PHI

A FORTRAN computer program which determines the orientation (with confidence limits) of an assumed double couple earthquake source given a series of teleseismically observed relative amplitudes, each of which relates the amplitudes of either P and pP, or P and sP, or pP and sP on one seismogram, is described. The use of the program is described with a description and explanation of the features and the input and output options. The program's range of applicability to various types of earthquake and seismogram is discussed. Author (ESA)

N80-22914# Danish Meteorological Inst., Copenhagen.
OCCURRENCES OF THE POLAR SLANT E CONDITION (SEC) AT NARSSARSSUAQ, GODHAVN, THULE, 1976
I. S. Primdahl 1977 46 p refs
(ISBN-87-7478-145-6) Avail: NTIS HC A03/MF A01

Tables of slant E condition (both certain and doubtful cases) scaled from the ionograms of Thule, Godhavn, and Narssarssuaq for the year 1976 are presented in the form of monthly data sheets. Author (ESA)

N80-22915# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
SOME RESULTS OF PRELIMINARY TESTS ABOUT THE CONTRAST VALUES SKY TO SEA (VISIBLE HORIZON) IN DEPENDENCE ON ENVIRONMENTAL PARAMETERS

Hans-Eberhard Hoffmann Mar. 1979 24 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-623)
(DFVLR-FB-79-10) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 5.10

The luminance of air and sea waters in the Baltic Sea was measured from a helicopter at heights of 15 m, 30 m, and 45 m. The measurements, which allowed a calculation of the contrast between air and sea as a function of various environmental parameters, are presented. The contrast was dependent on the angle between sunlight and measuring apparatus and on the height of the sea waves. Author (ESA)

N80-22916# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
SOLAR TERRESTRIAL PREDICTIONS PROCEEDINGS, VOLUME 1. PREDICTION GROUP REPORTS
Richard E. Donnelly, ed. Aug. 1979 445 p refs Presented at the Intern. Solar-Terrest. Predictions and Workshop, Boulder, Colo., 23-27 Apr. 1979
(PB80-134588; NOAA-79112601-Vol-1) Avail: NTIS HC A19/MF A01 CSCL 04A

The current state-of-the-art of solar terrestrial predictions is reviewed. The applications and the future needs for solar-terrestrial predictions are discussed. GRA

N80-22917# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
A COMPARATIVE SYNOPSIS OF MODEL ATMOSPHERES FOR 1954, 1958, 1962 AND 1976 BELOW 47 KILOMETERS
Robert H. Cordella, Jr. and Jeanne M. Olore Aug. 1979 23 p refs
(PB80-137805; NOAA-TM-ERL-ARL-79; NOAA-79121202) Avail: NTIS HC A02/MF A01 CSCL 04A

A simple means of comparing atmospheric models to each other and to data records by reducing them to one equation for each parameter versus altitude is presented. Constants and variables are tabulated by year and a computer program for generating the dependent variables is included. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-22918 Columbia Univ., New York.
A STUDY OF ALMOST-INTRANSITIVITY AS A POSSIBLE CAUSE OF TERRESTRIAL CLIMATE CHANGES Ph.D. Thesis
Kaustubha Bhattacharya 1979 166 p
Avail: Univ. Microfilms Order No. 8008703

A simple one dimensional energy balance climate model was extended in several ways. The most important modification was the inclusion of a time-lag parameter into the albedo-parameterization. Time-dependent solutions for one version of the model exhibit Hopf bifurcation from a stable equilibrium to stable periodic oscillations as the time lag is increased. Other versions of the model exhibit Hopf bifurcation from a stable equilibrium to stable quasi-periodic oscillations with increase in the time lag. Both types of oscillation are characteristic of almost-intransitive behavior. The amplitude and period of the oscillations is comparable to that found in the geological record for glaciation cycles. Thus, it is shown that almost-intransitivity can be one of the causes for terrestrial climate change over a wide range of time scales, in particular for the glacial-interglacial transitions of the Pleistocene epoch. Dissert. Abstr.

N80-22919 Nevada Univ., Reno.
FINITE THEORY OF CLOUD DROPLET GROWTH BY CONDENSATION Ph.D. Thesis
Norman Francis Robinson 1979 120 p
Avail: Univ. Microfilms Order No. 8008368

A new growth rate formula (NGRF) is developed for the rate of growth of cloud droplets by condensation. The theory used is a modification of the Lees-Shankar theory in which the two stream Maxwellian distribution function of Lees is used in Maxwell's method of moments to determine the transport of water vapor to and heat away from the droplet. The conventional theory involving ordinary diffusion with a free molecular flow matching to the droplet surface is used to derive a refined conventional growth rate formula (RCGRF). Comparisons are given between NGRF, RCGRF, and the growth rate formula of Carstens and Carter. Dissert. Abstr.

N80-22920 Illinois Univ. at Urbana-Champaign.
A DIAGNOSTIC STUDY OF THE NONLINEAR EFFECTS OF TRANSIENT AND STATIONARY EDDIES ON THE WINTER MEAN CIRCULATION Ph.D. Thesis
Carl Edward Youngblut 1979 131 p
Avail: Univ. Microfilms Order No. 8009221

The nonlinear effects due to transient eddies and the self interactions of the stationary eddies are analyzed for the large-scale winter mean circulation, based on potential vorticity equation for the zonally asymmetric time averaged quasigeostrophic hydrostatic motions. Using the geopotential height for January 1963 the individual terms of the potential vorticity equation are evaluated. In order to estimate the role of the nonlinear effects in maintaining the stationary geopotential field, the same potential vorticity equation is solved for the geopotential by regarding these nonlinear terms as apparent sources. Since the diabatic heating term was not analyzed, an additional source was assumed as estimated from the residual of the potential vorticity equation, which may represent approximately the diabatic heating source. Using appropriate boundary conditions at the pole, the equator, the bottom surface and the top of the atmosphere, the geopotential solutions forced by the individual sources were numerically calculated and compared. Dissert. Abstr.

N80-22921 Oklahoma Univ., Norman.
THE USE OF THE FINITE ELEMENT METHOD IN METEOROLOGICAL MODELLING Ph.D. Thesis
John Dutton Warburton 1979 126 p
Avail: Univ. Microfilms Order No. 8008665

The ability of the finite element method to serve as the means of solving the equations which describe flow in the atmosphere is examined. The type of finite element approximation best suited for meteorological research is discussed. Five different finite elements using both linear and quadratic interpolation were tested in the space domain. The elements in order to determine the most accurate and efficient configuration. The concepts of lumped and consistent mass were examined and tested as were alternative methods of handling the computer implementation of the method. Dissert. Abstr.

N80-22922 Utah Univ., Salt Lake City.
LATENT HEAT INDUCED DIVERGENCE AND THE ULTRA-LONG WAVES OF THE SUBTROPICS AND MIDLATITUDES Ph.D. Thesis
Fred Parker Lewis 1979 280 p
Avail: Univ. Microfilms Order No. 8008339

Winter and summer Goddard Institute of Space Studies (GSS) data system test (DST) (prototype global atmospheric research project (GARP) data) time average fields are compared with several average data sets. An analysis of the GISS DST data involving kinematically and nonellipitcally computed divergent flow fields suggests that the positioning of the subtropical jets and ultra long waves (wavenumbers 1-3) may be partially in response to strong longitudinal variations in tropical convective heating. Experiments with divergent barotropic and two level primitive equation models were used to test the short (1-3 days) and long (15-30 days) range effects of large scale tropical heating patterns upon the subtropical and midlattitude long and ultra long waves and flow patterns. Two level primitive equaton model experiments were conducted for the spherical earth with uniform mid and high lattitude net diabatic forcing. Long and short range tropical heating experiments with and without orography for mean Northern Hemisphere winter conditions were performed. Long and short range two level model tropical heating tests for the Southern Hemisphere winter in the presence of mountains were conducted. Dissert. Abstr.

N80-22923 Arizona State Univ., Tempe.
AN ANALYSIS OF PRECIPITATION PATTERNS AND TRENDS IN THE NORTH AMERICAN DESERT REGION Ph.D. Thesis
Harris Edward Williams 1979 344 p
Avail: Univ. Microfilms Order No. 8008586

Precipitation data for all stations with relatively long records (generally over 80 years) are analyzed in order to determine if there are any identifiable trends or cycles in the series. Regression analyses show that summer rainfall has been gradually increasing and that winter rainfall has been decreasing since about 1850. Autocorrelation of winter, summer, and annual rainfall values at selected long-term stations throughout the desert region shows that significant cycles exist in portions of the desert region at 80 to 90 years, 22 years, 4 to 6 years, and 2 year periods. Data are rank ordered and percentile values for each year are determined. The percentage of precipitation that falls in each season is determined to detect winter/summer dominance regimes. Annual, summer, and winter totals and summer/winter ratios of precipitation data are correlated with the double sunspot cycle. Dissert. Abstr.

N80-22924*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE STRATCOM II EFFORT
Edith I. Reed, ed. Apr. 1980 221 p refs
(NASA-TP-1640) Avail: NTIS HC A10/MF A01 CSCL 04B

The ozone-nitrogen oxides ultraviolent flux interactions were investigated to obtain data on stratospheric photochemistry. The balloon, rocket, and aircraft operations are described along with the instruments, parameter measurements, and payloads.
F.O.S.

N80-22925*# Radio Sciences Co., Melbourne, Fla.
SOLAR TERRESTRIAL RELATIONSHIPS RELATED TO THUNDERSTORMS AND BUV DARK CURRENT AND OZONE DATA Final Report, Jul. - Dec. 1979
John R. Herman 25 Jan. 1980 54 p refs
(NASS-25663)
(NASA-CR-159957; RSCR-80-1) Avail: NTIS HC A04/MF A01 CSCL 04B

Solar terrestrial interactions as they affect Nimbus 4 BUV dark current and possibly affect thunderstorm occurrence are investigated. A solar wind index is calculated for 1970 to 1971. Dark current enhancements appear to be associated in some way with solar proton events and the solar wind index, but additional investigations by GSFC are required before conclusions can be drawn. Superposed epoch analysis of an index of North American thunderstorm occurrence reveals a discernible increase in the index magnitude on days 1 and 2 following solar proton events. There appears to be little or no 27 day recurrence tendency in thunderstorm occurrence frequency and no association with vorticity area index on a day to day basis. Author

N80-22926# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
SUPPRESSION OF RIVER ICE BY THERMAL EFFLUENTS
George D. Ashton Dec. 1979 30 p refs
(AD-A080654; CRREL-79-30) Avail: NTIS HC A03/MF A01 CSCL 08/12

The ice suppression resulting from discharge of warm water into rivers during winter is analyzed with emphasis on two different cases. In Part 1 the case of a thermal effluent fully mixed across the flow section is analyzed to include the effects of unsteadiness in the effluent temperature and the meteorological variations. The location of the ice edge is determined either by a 0 C water temperature criterion or an equilibrium ice melting analysis. The choice of the applicable criterion emerges naturally from the analysis even though the location of the ice edge may be considerably different when a steady-state analysis is done. In Part 2 the case of a side discharge of heated effluent is analyzed, also in an unsteady manner, and the effects of transverse dispersion are included in the analysis. Comparisons are made in both Parts 1 and 2 to limited field data that are available.
GRA

N80-22927# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MARKOV SIMULATIONS OF ONE-AND TWO-DIMENSIONAL WEATHER DATA BASES M.S. Thesis
Steven R. Schroeder Dec. 1979 182 p refs
(AD-A080217; AFIT/GOR/MA/79D-9) Avail: NTIS HC A09/MF A01 CSCL 04/2

In many cases, weather is only one of many inputs to a simulation model, so a realistic but simple weather simulation method should be included in the model. This paper has three major areas of concern: (1) a fairly extensive review of applications of one dimensional Markov and semi-Markov chains to weather data simulations, (2) a consideration of factors involved in and methods that are appropriate for extending Markov concepts to simulating gridded data in two or more dimensions, and (3) evaluation of the proposed methods in terms of realism and simplicity of application. A discussion of the general characteristics of real weather variables and observed weather data in the context of simulating weather as a stochastic process is also given. The data base used for the example consisted of gridded weekly maps of temperature departures from normal in an area of the United States. For most analyses, the data was converted to five states, from state 1 (coldest) to state 5 (warmest). In the real data, it was rare to have an occurrence of unequal and nonconsecutive states in adjacent grid points. Such occurrences were called 'unusual transitions', and one criterion for evaluating the realism of a weather simulation scheme was the frequency of generating such transitions. GRA

N80-22928# Stanford Univ., Calif. Stanford Electronics Lab.
RAPID-SCANNING MEASUREMENTS OF WIND-PRODUCED DOPPLER ON AN ASYMMETRICAL MICROWAVE TRANSHORIZON PROPAGATION PATH
Ronald Douglas Fleming Jun. 1979 143 p refs
(Contract N00014-75-C-0601)
(AD-A080592; SU-SEL-79-016; TR-4504-1) Avail: NTIS HC A07/MF A01 CSCL 04/2

Conventional methods for monitoring winds aloft have inherent spatial and/or temporal limitations that severely restrict their usefulness. An alternate solution is the use of transhorizon bistatic radio techniques. By using a phase-coherent system with some form of beam-swinging capability, it is possible to measure the wind-produced Doppler shifts associated with moving off-path scatterers. In this experiment a rapid data-gathering system is used to remotely probe the wind-field velocity structure in the common volume region of a 164 km transhorizon propagation path. The phase-stable system operates at 3.2 GHz and employs a 12 element horizontal receiving antenna array. The amplitudes and relative phases of the output signals from the individual elements are sequentially sampled and recorded at a 40 Hz rate. Off-line processing of the amplitude and phase data samples is used to 'scan' in azimuth a 0.3 deg wide fan beam through a 3.88 deg sector and to obtain virtual simultaneous Doppler spectra measurements at a continuum of angles within the sector scanned. An algorithm developed to identify the apparent source direction of each spectral component permits an appropriate weighting to be applied to the spectra on the basis of angle-of-arrival. The average Doppler shift (spectrum centroid) as a function of the array pointing angle is interpreted in terms of the average transverse wind speed and direction. GRA

N80-22929# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
STOCHASTIC MODELING OF CLIMATIC PROBABILITIES Final Report, 1 Jun. 1977 - 31 Aug. 1979
Paul N. Somerville and Steven J. Bean Hanscom AFB, Mass. AFGL Nov. 1979 22 p refs
(Contract F19628-77-C-0080; AF Proj. 6670)
(AD-A080559; AFGL-TR-79-0222) Avail: NTIS HC A02/MF A01 CSCL 04/2

This report summarizes the work done in the past two years in the Stochastic Modeling of Climatic Probabilities of weather events. Models are presented for visibility, windspeed, skycover, rainfall and ceiling. The models were each applied to more than twenty stations. GRA

N80-22930# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
FOG EVOLUTION IN THE VISIBLE AND INFRARED

SPECTRAL REGIONS AND ITS MEANING IN OPTICAL MODELING Research and Development Report
Richard D. H. Low Dec. 1979 59 p refs
(DA Proj. 1L1-61101-AH-71)
(AD-A080352; ERADCOM/ASL-TR-0046) Avail: NTIS HC A04/MF A01 CSCL 04/2

For the first time in the field of cloud physics, high-density fog drop-size data from the time near fog formation through the time near fog dissipation became available at 5 minute intervals from field measurements carried out at Meppen, Germany, on 3-4 March 1978. The fog was believed to have been brought about by frontal passage. Extinction coefficients in the 0.55 micrometers, 3.80 micrometers, and 10.6 micrometers spectral regions were calculated from the measured drop-size distributions and plotted as a function of time to depict optical evolution of the fog. Such spectral evolution in relation to fog microphysical evolution was examined in detail to attempt to formulate optical models or scaling laws for electro-optical sensors applications. A cursory comparison was made with the California advection and radiation-advection fogs observed at Fort Ord on 3 and 9 May 1978, respectively, because the available data portrayed only portions of their life cycles. Because of their low liquid water contents and high number concentration, the haze regimes in these fogs played a dominant role in 'messing up' spectral transmission in the 0.55 micrometers, and 3.80 micrometers regions, usually during the phase of fog formation. In the final analysis, the choice of a particular or a general model or scaling law should be dictated by the sensitivities and requirements of the electro-optical sensors to be deployed. GRA

N80-22931# European Space Agency, Paris (France).
NEW APPROXIMATE EQUATIONS FOR THE SATURATION PRESSURE OF WATER VAPOR AND FOR HUMIDITY PARAMETERS USED IN METEOROLOGY
Werner Boegel Jan. 1979 158 p refs Transl. into ENGLISH of "Neue Naeherungsgleichungen fuer den Saettigungsdruck des Wasserdampfes und fuer die in der Meteorologie Gebraeuchlichen Luftfeuchte-Parameter", Rept. DLR-FB-77-52 DFVLR, Oberpfaffen, West Germany, Oct. 1977 Original report in GERMAN previously announced as X79-72011
(ESA-TT-509; DLR-FB-77-52) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 61.60

Approximate equations for the saturation pressure of water vapor in the pure as a function of temperature, for the corresponding inverse functions, and for some real-gas correction factors, based on the Goff-Gratch formulation were developed because the Groff-Gratch formulation of the thermodynamic properties of moist air, used by the World Meteorological Organization (WMO) as a basis for the calculation of humidity parameters, is often too complicated for direct applications. These amplified equations are used to establish methods for calculating the most important humidity parameters, e.g. dew-point temperature, relative humidity, mixing ratio etc. These methods, consisting for the most part of simple formulae, are tailored for meteorological applications, without assuming perfect gases.
Author (ESA)

N80-22932# World Meteorological Organization, Geneva (Switzerland).
QUANTITATIVE METEOROLOGICAL DATA FROM SATELLITES
Christopher M. Hayden, Lester F. Hubert, E. Paul McClain, and Robert S. Seaman 1979 114 p refs Original contains color illustrations
(WMO-531; ISBN-92-63-10531-6) Avail: NTIS HC A06/MF A01; WMO, Geneva SWFR 20

The major quantitative information available from meteorological satellite measurements on a regular basis is discussed. Remote soundings of atmospheric temperature and moisture, winds derived from cloud motions observed by geostationary satellites, and Earth surface temperature are included. The application of quantitative satellite data (principally remote temperature soundings) in numerical weather analysis and prediction is also covered. Topics covered include: basic theory behind these quantitative measurements; problems and procedures involved in arriving at useful quantitative results and in applying the data; assessments of the quality of the derived quantities; and illustrations of the various types of data produced. Author (ESA)

N80-22933# Physics Lab. RVO-TNO, The Hague (Netherlands).
AEROSOL MEASUREMENTS DURING SPRING 1978: THEIR SIZE DISTRIBUTIONS AND OPTICAL PROPERTIES IN VISIBLE AND INFRARED WAVELENGTH REGIONS
M. J. M. vandeVen Oct. 1978 102 p refs
(PHL-1978-41; TDCK-71515) Avail: NTIS HC A06/MF A01

Daily aerosol measurements performed north of the Hague are described. The majority of the aerosol spectra, with sizes between 0.163 and 18 micrometers, appear to be composed of a superposition of a continental and a maritime aerosol. The optical properties of the aerosols are investigated also, by a monostatic Mie-lidar at 1.06 micrometers. The resulting extinction and backscatter are compared with the values of these scattering parameters calculated from Mie theory. There is good agreement for the extinction at visibilities beyond one kilometer. Foggy weather shows a much higher value for the extinction coefficient as calculated from Mie theory. The backscatter is about a factor of five larger for Mie theory. For 0.55, 0.6943, 5.0 and 10.6 micrometers the same parameters were calculated in order to give an idea about spectral behavior of the sampled aerosols. Author (ESA)

N80-22934# Physics Lab. RVO-TNO, The Hague (Netherlands).
MOVING PRECIPITATION CLUTTER SUPPRESSION FOR FUCAS
H. F. A. Roefs Jan. 1979 27 p refs
(PHL-1979-02; TDCK-71721) Avail: NTIS HC A03/MF A01

The implementation of a rainclutter suppression system in pulse radar systems such as FUCAS is discussed. Using a simplified rainclutter model, the minimum required clutter suppression as a function of the slant range is determined. It is shown that a set of 5 pulse cancellers provides sufficient clutter suppression for rainfall rates up to 3.5 mm/h. Author (ESA)

N80-22935# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
OPTICAL AND ATMOSPHERIC OPTICAL PARAMETERS DURING VISIBILITY TESTS IN NORTHERN GERMANY, 1977
Hans-Eberhard Hoffmann Jun. 1979 94 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-615)
(DFVLR-MITT-79-06) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 15

Measurements of the inherent contrast of a 1.5 ton truck and a minesweeper were carried out using a photometer mounted in a helicopter. The results of the measurements are presented in diagrams and tables as a function of the background, the illumination of the target region, the angle of elevation, the time of day, the angle of azimuth, and the degree of cloud cover.
Author (ESA)

N80-22936# World Meteorological Organization, Geneva (Switzerland). Global Atmospheric Research Programme.
NUMERICAL METHODS USED IN ATMOSPHERIC MODELS, VOLUME 2
Sep. 1979 508 p refs Prepared in cooperation with International Council of Scientific Unions, Rome, Italy
(GARP-Publ-17-Vol-2) Avail: NTIS HC A22/MF A01

A description of numerical methods applicable to atmospheric models is presented, including vertical coordinates and related discretization, difference approximations for fluid flow on a sphere, the spectral method, the pseudospectral method, the finite element method, difference approximations to quasi-geostrophic models, computational problems related to limited-area modeling, the semi-implicit method, phase speed errors due to various time differencing schemes, and nonlinear stability. Author (ESA)

N80-22937# World Meteorological Organization, Geneva (Switzerland).
BASIC SYNOPTIC NETWORKS OF OBSERVING STATIONS
1979 500 p In ENGLISH and FRENCH
(WMO-217) Avail: NTIS HC A21/MF A01

A directory is presented of the regional basic synoptic networks for each of the six WMO regions with a separate section devoted to the basic network for the Antarctic. Each section describes the state of implementation of the basic network and plans for elimination of deficiencies for each country. The stations in each country within a region are identified by an index number, and the surface and upper air observations made by each station given. Author (ESA)

N80-22938# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH: GLOBAL OBSERVING SYSTEM-SATELLITE SUB-SYSTEM. INFORMATION ON THE APPLICATION OF METEOROLOGICAL SATELLITE DATA IN ROUTINE OPERATIONS AND RESEARCH: ABSTRACTS, ANNUAL SUMMARIES AND BIBLIOGRAPHIES
1979 158 p refs
(WMO-475) Avail: NTIS HC A08/MF A01

The titles, abstracts and other relevant information for 59 papers contributed by 14 nations to the World Weather Watch-Global observing system program are presented, in relation to meteorological satellite data applications. Author (ESA)

N80-22939# National Technical Information Service, Springfield, Va.
WIND SHEAR, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 196 p Supersedes NTIS/PS-78/1315; NTIS/PS-77/-1172; NTIS/PS-76/1040; NTIS/PS-75/874
(PB80-802986; NTIS/PS-78/1315) Avail: NTIS HC $30.00/MF $30.00 CSCL 04B

The phenomena of wind shear effects in various environments are investigated. Aircraft, spacecraft launchings, atmospheric turbulence, and air water interactions are among the areas reviewed. This updated bibliography contains 189 abstracts, 44 of which are new entries to the previous edition. GRA

N80-22940# National Technical Information Service, Springfield, Va.
WIND SHEAR. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1979
Guy E. Habercom, Jr. Dec. 1979 168 p Supersedes NTIS/PS-78/1316; NTIS/PS-77/1173; NTIS/PS-76/1041
(PB80-802994; NTIS/PS-78/1316; NTIS/PS-77/1173; NTIS/PS-76/1041) Avail: NTIS HC $30.00/MF $30.00 CSCL 04B

The phenomena of wind shear effects on aircraft, spacecraft launchings, atmospheric turbulence, and air/water interactions are reviewed. This updated bibliography contains 162 abstracts, 21 of which are new entries to the previous edition. GRA

N80-22941# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
NUMERICAL MODELING OF BUOYANT PLUMES IN A TURBULENT, STRATIFIED ATMOSPHERE
Ralph G. Bennett and Michael W. Golay Jan. 1979 236 p refs Sponsored in part by Consolidated Edison Co. of New York, Inc., and Northeast Utilities Service Corp.
(PB80-118953; MIT-EL-79-002) Avail: NTIS HC A11/MF A01 CSCL 04B

A computational model of buoyant, bent plumes in realistic atmospheres is presented. The model, constructed using numerically integrated two dimensional, time dependent fluid mechanics equations and a number of physical approximations is described. The ability of the model to reproduce the solutions to problems that are known is demonstrated. GRA

N80-22942# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
SATELLITE STUDIES DURING THE 1976 - 1977, 1977 - 1978 SIERRA COOPERATIVE PILOT PROJECT Final Report, 2 Dec. 1975 - 30 Sep. 1978
K. Robert Morris, David W. Reynolds, and Thomas H. VonderHaar Feb. 1979 97 p refs
(Contract DI-6-07-DR-20020)
(PB80-126303) Avail: NTIS HC A05/MF A01 CSCL 04B

Digital satellite data from the SMS-2 geostationary satellite were analyzed for the 1976-77 and 1977-78 seasons of the Sierra cooperative pilot project. Temporal variations in cloud top temperatures for five case storms are presented. Three storms types and associated synoptic conditions defined by the satellite viewed cloud types are discussed. Mesoscale features and their precipitation effects are examined. GRA

N80-22943# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
DATA REPORT ON MEASUREMENTS OF PRECIPITABLE WATER VAPOR AND CLOUD LIQUID AT FORT SILL, OKLAHOMA, SESAME 1979
F. O. Guiraud, J. Howard, and D. C. Hogg Oct. 1979 87 p ref
(PB80-133762; NOAA-DR-ERL-WPL-2; NOAA-79121207) Avail: NTIS HC A05/MF A01 CSCL 04B

A two channel microwave radiometer was operated from March 29, 1979 to June 8, 1979 for the measurement of precipitable water vapor as part of the 1979 Severe Environmental Storms and Mesoscale Experiment (SESAME) program. The radiometers were located on the Fort Sill military base at Lawton, OK, approximately 140 miles southwest of Norman, OK, to provide a continuous monitor of total precipitable water vapor as it flows from the Gulf of Mexico into the SESAME monitoring area. The summaries of the measurements of precipitable water vapor, and condensed water (cloud liquid and rain), along with vapor measurements obtained from radiosonde measurements at Fort Sill and Oklahoma City, OK are presented. Rainfall summaries obtained toward the end of the measurement period when a rain gauge was installed at the radiometer site are included. GRA

N80-22944# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
MEASURES OF INHOMOGENEITY OF AEROSOLS
V. E. Derr, G. M. Lerfald, and M. J. Post Sep. 1979 101 p refs
(PB80-133770; NOAA-TM-ERL-WPL-38; NOAA-79121206) Avail: NTIS HC A06/MF A01 CSCL 04B

The use of laser illuminators which reflect from aerosol inhomogeneities and measure their time of passage over a known distance is considered. The configuration is also called transit time lidar. The principal potential advantage of the eddy correlation technique is obtaining transverse wind velocity measurements, i.e., the velocity perpendicular to the beam, contrary to Doppler techniques which can measure only velocity components lying in the direction of the radiation beam. GRA

N80-22945# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
A PROGRAM PROSPECTUS FOR A COOPERATIVE HIGH PLAINS EXPERIMENT ON CONVECTIVE PRECIPITATION
Oct. 1979 45 p Prepared in cooperation with the Bureau of Reclamation, Washington, D.C.
(Grant NSF ATM-77-23757)
(PB80-122302; NCAR/TN-145/PPR) Avail: NTIS HC A03/MF A01 CSCL 04B

The program prospectus for cooperative 1981 field season in Montana is discussed. The scientific objectives, the equipment used, and the organizational aspects of the program are described. GRA

N80-22946# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
A SUMMARY OF RECENT ATMOSPHERIC DIFFUSION EXPERIMENTS
Roland Draxler Apr. 1979 39 p refs
(PB80-111396; NOAA-TM-ERL-ARL-78; NOAA-79092603) Avail: NTIS HC A03/MF A01 CSCL 04B

Diffusion experiments conducted in areas with complex topography or meteorology such as near shoreline environments, over rough and complex terrain, above and within forest canopies, and over urban areas are described. Experiments designed to investigate dispersion under low wind speed conditions, and the processes of transport and disperion over long distances are discussed. The results in each category are discussed and the dispersion data are illustrated in a summary diagram. The

dispersion data are compared to calculated values from predictive methods developed for homogeneous terrain. GRA

N80-22947# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
AN OCEAN CLIMATE RESEARCH PLAN
J. O. Fletcher Aug. 1979 58 p refs
(PB80-112873; NOAA-79092106) Avail: NTIS HC A04/MF A01 CSCL 04B

The rational and a recommended plan for a research program on the oceanic processes that underlie the dynamics of the global climate and its variability are presented. The role of the program in identifying the processes responsible for year to year climate change is discussed. The application of the program's results towards developing conceptual and numerical models for use in the simulation and prediction of climate is outlined. A.W.H.

N80-22948# National Hurricane and Experimental Meteorology Lab., Boulder, Colo.
SATELLITE ESTIMATED RAINFALL IN GATE
William L. Woodley, Cecilia G. Griffith, Joseph S. Griffin, and Scott C. Tromatt Sep. 1979 63 p refs
(PB80-131402; NOAA-TM-ERL-NHEML-6; NOAA-79121204)
Avail: NTIS HC A04/MF A01 CSCL 04B

Quantitative precipitation estimates were made for the GARP Atlantic tropical experiment from geosynchronous, infrared satellite imagery and a computer automated technique which is described. The satellite generated B scale rainfall patterning is similar to, and the rain volumes are within 10% of those provided by radar. Superposition of the satellite generated rainfall maps and sea surface temperature maps by phase is discussed. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-22949*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH ENERGY BENTHIC BOUNDARY LAYER EXPERIMENT (HEBBLE): PRELIMINARY PROGRAM PLAN AND CONCEPTUAL DESIGN
Kent Frewing 15 Feb. 1980 94 p refs Sponsored in part by ONR
(Contract NAS7-100)
(NASA-CR-163003; JPL-Pub-80-2) Avail: NTIS HC A05/MF A01 CSCL 08C

Deep sea processes of flow-sediment interaction, particularly the role of high energy ocean bottom current events in forming the seafloor topography, transporting material, and mixing the bottom of the water column are examined. A series of observations at and near the sea bottom, in water depths of 4 to 5 km, in areas of the western North Atlantic where high energy current events occur, include site surveys and physical reconnaissance to identify suitable areas and positions, and one or more six month experiments to investigate temporal and spatial variations of high energy events within the boundary layer and their interaction with the seabed. Descriptions of proposed HEBBLE activities are included, with emphasis on technology transfer to the oceanographic community through design, fabrication, testing, and operation of an instrumented ocean bottom lander. E.D.K.

N80-22950# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Numerical Modeling Div.
THE NORDA/FLENUMOCEANCEN THERMODYNAMICAL OCEAN PREDICTION SYSTEM (TOPS): A TECHNICAL DESCRIPTION
R. Michael Clancy and Paul J. Martin Nov. 1979 34 p refs
(AD-A080248; NORDA-TN-54) Avail: NTIS HC A03/MF A01 CSCL 08/10

The Thermodynamical Ocean Prediction System (TOPS) is a general and flexible software framework for operational implementation of upper ocean forecast models at Fleet Numerical Oceanography Center (FLENUMOCEANCEN), Monterey, California. It was developed by NORDA Code 322 as a part of the Navy's Automated Environmental Prediction System (AEPS). TOPS is fully interfaced with the FLENUMOCEANCEN operational data base and meets all FLENUMOCEANCEN programming standards for operational programs. This technical note discusses the uses for TOPS, provides documentation of the physics currently represented in the system, indicates probable future developments, and briefly addresses the problem of forecast verification. GRA

N80-22951# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Chemisches Lab./Analytik.
ANALYTICAL INVESTIGATION OF THE GROWTH LAYERS OF PACIFIC OCEAN MANGANESE NODULES ON A SEMI-MICRO SCALE Final Report
Hans-Martin Lueschow Dec. 1978 44 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FB-M-78-04) Avail: NTIS HC A03/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 9,25

X-ray fluorescence analysis was used to examine the chemical composition of manganese nodules from the Pacific Ocean floor. Nodules found close to each other were significantly different in the structure of their various layers. Conclusions pertaining to the origin of the nodules are discussed.
Author (ESA)

N80-22952# National Geodetic Survey, Rockville, Md.
GRAVIMETRIC TIDAL LOADING COMPUTED FROM INTEGRATED GREEN'S FUNCTIONS
Clyde C. Goad Oct. 1979 23 p refs
(PB80-128903; NOAA-TM-NOS-NGS-22; NOAA-79113002)
Avail: NTIS HC A02/MF A01 CSCL 08E

A method of predicting the effects of ocean tides on geodetic measurements using integrals of Green's functions with the desired ocean tide model is presented. Predictions are presented to the loading effects on Earth tide gravimeter measurements using a global M2 ocean tide model. Calculations for loading effects on tidal gravity data available for western Europe are confirmed to an accuracy of plus or minus 0.2 microgal for most sites. GRA

N80-22953# National Geodetic Survey, Rockville, Md.
GEODETIC LEVELING AND THE SEA LEVEL SLOPE ALONG THE CALIFORNIA COAST
Emery I. Balazs and Bruce C. Douglas Sep. 1979 27 p refs
(PB80-120611; NOAA-TM-NOS-NGS-20; NOAA-79102402)
Avail: NTIS HC A03/MF A01 CSCL 08F

Leveling surveys performed between the San Francisco and San Pedro tide stations for the epochs 1968-69, 1968-71, 1971-72 1973-75, and 1977-78 are discussed. The observed elevations at these tide stations are compared to mean sea levels of the 1941-59 epoch. The data indicates that San Pedro is rising with respect to San Francisco or that San Francisco is subsiding with respect to San Pedro at an average rate of about 70 mm/yr. A large discrepancy between relative movement rates from repeat leveling and tidal observations is examined. Computations of elevation difference are presented. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-22954 Illinois Univ. at Urbana-Champaign.
INACTIVATION OF ENTEROVIRUSES BY OZONE Ph.D. Thesis
Dipak Roy 1979 137 p
Avail: Univ. Microfilms Order No. 8009151

The kinetics of inactivation of enteroviruses was studied to a continuous flow, constant temperature reactor. Poliovirus 1 (Mahoney) was used as a model enteroviruses to study the mechanism of inactivation and to evaluate the effects of different environmental parameters on the kinetics of inactivation. Virus survival curves under all experimental conditions were observed to follow a similar pattern; a rapid rate of inactivation for the initial period followed by a slow rate of inactivation. The all or none effect, previously associated with ozone disinfection, was markedly absent. The survival curves did not follow single order

kinetics; it is believed that the inherent nature of the virus may be responsible for this observation. Dissert. Abstr.

N80-22955*# National Aeronautics and Space Administration, Washington, D. C.

EFFECTS OF AUDIO-VISUAL STIMULATION ON THE INCIDENCE OF RESTRAINT ULCERS ON THE WISTAR RAT

M. S. Martin, F. Martin, and R. Lambert Dec. 1979 7 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol., v. 164, no. 8/9, 1970 p 1748-1750 Original document announced as N80-19748 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75950) Avail: NTIS HC A02/MF A01 CSCL 06C

The role of sensory simulation in restrained rats was investigated. Both mixed audio-visual and pure sound stimuli, ineffective in themselves, were found to cause a significant increase in the incidence of restraint ulcers in the Wistar Rat. R.E.S.

N80-22956*# National Aeronautics and Space Administration, Washington, D. C.

ROLE OF ADRENALS IN THE MOBILIZATION OF CARBOHYDRATE AND FAT RESOURCES AFTER OVERSTIMULATION OF RATS

G. G. Khechinashvili Jan. 1980 13 p refs Transl. into ENGLISH FROM Farmakol. Toksikol. (USSR), v. 35, no. 5, 1972 p 575-580 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by USSR Acad. of Med. Sci., Leningrad

(Contract NASw-3198)

(NASA-TM-75974) Avail: NTIS HC A02/MF A01 CSCL 06C

The role of the cortical and cerebral layers of the adrenal glands in mobilizing carbohydrate and fatty resources in response to the effect of an extreme stimulant was investigated. It is shown that following adrenodemedullation and adrenalectomy, the leading role is played by the secretion of the adrenal medullary layer, whereas the role of suprarenals in the mobilization of fats is only slightly pronounced. R.C.T.

N80-22957*# National Aeronautics and Space Administration, Washington, D. C.

STATE OF THE MITRAL VALVE IN RABBITS WITH HYPOKINESIA

V. Ye. Strelkovska Dec. 1979 7 p refs Transl. into ENGLISH from Dopov. Akad. Nauk Ukr. RSR, Ser. Geol., Khim. Biol. Nauky, V. 36, no. 1, 1974 p 72-75 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76003) Avail: NTIS HC A02/MF A01 CSCL 06C

In hypokinesia, edema of all the layers of the mitral valve was observed, which resulted in morphological changes of the cellular and noncellular components. An increase in ratio of elastic and collagenic fibers in the value was also observed along with and changes in their structural and staining properties. The observed changes can limit valve mobility and can result in manifestations of cardiac valve insufficiency, which is found clinically. R.E.S.

N80-22958*# National Aeronautics and Space Administration, Washington, D. C.

ANIMAL EXPERIMENTAL RESEARCH ON MICROSTRUCTURAL BEHAVIOR ON THE HYALINE ARTHROIDAL CARTILAGE AFTER IMMOBILIZATION AND REMOBILIZATION

H. J. Refior 3 Feb. 1980 6 p refs Transl. into ENGLISH from Langenbecks Archmany Fuer Chirugie (West Germany), 1976 p 296-298 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76050) Avail: NTIS HC A02/MF A01 CSCL 06C

The degeneration of the articular cartilage after a period of immobilization was investigated. The experiment was carried out by the immobilization of the knee joints of rabbits. Even after remobilization there was an increase in the alterations. These changes did not prove to be reversible. R.C.T.

N80-22959*# National Aeronautics and Space Administration, Washington, D. C.

INCORPORATION OF GLYCINE-2-C-14 IN ACID-INSOLUBLE PROTEINS OF RAT BONES AND TEETH DURING HYPOKINESIA AND ADMINISTRATION OF THYROCALCITONINE

A. I. Volozhin, L. I. Steklolnikov, N. N. Uglova, and V. Ye. Potkin Dec. 1979 8 p refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), v. 37, no. 2, 1974, p 223-226 Original language document was announced as A72-40432 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75981) Avail: NTIS HC A02/MF A01

A forced limitation of the motor activity in rats (from 5 to 60 days) results in reduced incorporation of glycine 2-C14 in the total acid insoluble proteins of limb bones and its increase in the teeth and mandibular-maxillary bones. Daily administration of five micrograms of thyrocalcitonine together with polyvinylpyrrolidone normalizes the protein metabolism in the bone tissues during the 40 days of experimentation. E.D.K.

N80-22960*# National Aeronautics and Space Administration, Washington, D. C.

THE ULCEROGENIC EFFECT OF BILE AND BILE ACID IN RATS DURING IMMOBILIZATION STRESS

J. Weisener Feb. 1980 14 p refs Transl. into ENGLISH from Z. Gastroenterol. (West Germany), v. 12, no. 7, 1974 p 539-546 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-76054) Avail: NTIS HC A02/MF A01 CSCL 06C

The effect of different concentrations of oxen bile and individual bile acids or their sodium salts on the gastric mucosa of rats was investigated in combination with immobilization stress. A statistically significant higher frequency of ulcers was only determined in the application of 10% oxen bile. Dosages on 10% sodium glycocholic acid demonstrated strong toxic damage with atonic dilation of the stomach and extensive mucosal bleeding. R.E.S.

N80-22961*# National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF PROLONGED HYPODYNAMIA ON CERTAIN PHYSIOLOGICAL FUNCTIONS IN DOGS

B. R. Yaremenko Dec. 1979 8 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), v. 14, no. 6, Nov. - Dec. 1970 p 10-13 Translation was announced as N74-19752 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75979) Avail: NTIS HC A02/MF A01

The behavior of 20 dogs whose mobility was restricted was experimentally investigated. Their reactions to hypodynamia were either active behavior or progressive general depression and increased muscular weakness. Arterial pressure, pressor sinocarotid reflex valve, body weight, pulse rate, body temperature, and plasma cholinesterase activity were monitered for 28 days. Results are reported. E.D.K.

N80-22962*# National Aeronautics and Space Administration, Washington, D. C.

THE EFFECT OF RESTRAINING ON THE HEART RATE IN GUINEA PIGS

H. Mikiskova Jan. 1980 12 p refs Transl. into ENGLISH from Activ. Nerv Super/ (Czech.), v. 10, no. 4, 1968 p 382-388 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-76006) Avail: NTIS HC A02/MF A01 CSCL 06C

The emotional effect of different applications of electrodes and the fixation for cariographic examination was investigated using guinea pigs. The effect of the stress is discussed in terms of heart rhythm and behavior. R.E.S.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-22963* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 205
Apr. 1980 68 p
(NASA-SP-7011(205)) Avail: NTIS HC$7.00 CSCL 06E

This bibliography lists 212 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1980. Author

N80-22964 State Univ. of New York at Stony Brook.
MULTIVARIATE ANALYSIS OF PHYSIOLOGICAL RESPONSE TO ENVIRONMENTAL STRESS Ph.D. Thesis
Edith Alker Zang 1979 396 p
Avail: Univ. Microfilms Order No. 8007325

Forty-five physiological response variables were recorded at various time intervals on three volunteers during each of one hundred experimental sessions conducted in a controlled environmental chamber. Besides the physiological measurements, fourteen environmental variables were also recorded to examine their influence on the subjects during the tests. The data was analyzed using multivariate techniques including factor analysis nonmetric multidimensional scale analysis and regression analysis to determine the relationship among the variables under varying environmental combinations, and also to evaluate the effectiveness of these techniques when applied to physiological data. The results of the analyses indicate that multivariate techniques, particularly factor analysis, can accurately summarize the complex highly interactive physiological reactions recorded in the study. Dissert Abstr.

N80-22965 Columbia Univ., New York.
MATHEMATICAL MODELING, SIMULATION, AND STABILITY OF THE RESPIRATORY CONTROL SYSTEM Ph.D. Thesis
Edward Firouztale 1979 288 p
Avail: Univ. Microfilms Order No. 8008722

A mathematical model of the respiratory control system was developed. This model consisted of a sub-model of the oxygen and carbon dioxide stores and a second sub-model of the controlling system. The models together with the reference parameter values, were used to simulate the effects of various periods of apnea (periods of nonbreathing) and recovery from apnea. The results are of interest in connection with studies of sudden infant death syndrome. Simulation and linear stability analysis were used to determine the stability of the system and, in particular, the gain that will render the respiratory control system unstable. It was found that limit cycles exist and that the cardiac output has a major effect on stability of the respiratory control system. Finally, the effect of O2-CO2 interactions at the controller level, on stability, was studied. Dissert. Abstr.

N80-22966 Michigan Univ., Ann Arbor.
INVESTIGATION OF CIRCADIAN RHYTHMS ON SELECT PSYCHOMOTOR AND NEUROLOGICAL FUNCTIONS Ph.D. Thesis
Andris Freivalds 1979 280 p
Avail: Univ. Microfilms Order No. 8007740

The existence of circadian rhythms in response variables that relate most meaningfully to the physiological and neurological state of the body throughout the day and which may be indices of performance was investigated. Various models, including a 2-parameter, 3-parameter and 6-parameter cosine model and an autoregressive model were fit to the data. For the variables with data pooled across subjects and days, the averaging effect tended to minimize the better fit of higher order models. The 2-parameter cosine model is sufficient to explain a (normal) average rhythm. On the other hand, the individual subject data of resting heart rate was more variable and yielded significantly better fits with the higher order models for all three subjects. Dissert. Abstr.

N80-22967*# National Aeronautics and Space Administration, Washington, D. C.
REACTIVITY OF ORGANISM IN PROLONGED SPACE FLIGHTS
P. V. Vasilyev Jan. 1980 14 p refs Transl. into ENGLISH from Astronaut. Acta (Austria), v. 17, 1972 p 107-112 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(NASA-TM-75975) Avail: NTIS HC A02/MF A01 CSCL 06S

An analysis of published data are presented as well as the results of experiments which show that the state of weightlessness and hypodynamia result in a reduced orthostatic and vestibular resistance, increased sensitivity to infections, decreased endurance of accelerations and physical exercises, and altered reactivity of the organism to drugs. Various consequences of weightlessness on the human body, especially weightlessness combined with other factors linked to long space flights are also considered. R.C.T.

N80-22968*# National Aeronautics and Space Administration, Washington, D. C.
DYNAMICS OF CHANGE OF LIPID AND MONOAMINE METABOLISMS AND THE BLOOD COAGULATION SYSTEM DURING EXPERIMENTAL ATHEROSCLEROSIS CAUSED BY RESTRICTION OF MOVEMENT
G. S. Gvishiani and N. G. Kobakhidze Apr. 1980 5 p Transl. into ENGLISH from Soobshch. Akad. Nauk. Gruz. SSR (USSR), v. 60, no. 2, 1970 p 445-447 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Georgian SSR Acad. of Sci., Tbilisi, USSR
(Contract NASw-3199)
(NASA-TM-76033) Avail: NTIS HC A02/MF A01 CSCL 06S

Shifts in lipid, catecholamine, and blood coagulation systems following various periods (1, 2, 3, and 4 months) of experimentally induced atherosclerosis were studied. The same indices were studied in the tissues of the myocardium, liver, and brain stem-reticular formation after decapitation of the animals at the end of the experiment. Periodic motion restriction caused an increase in blood beta-lipoproteins in the rabbits at the beginning of the experiment. An increase in general cholesterol content and a decrease in the lecithincholesterol index were established at the end of the experiment. Myocardial beta-lipoprotein and brain stem reticular formation general cholesterol contents were elevated; catecholamine content was increased at the end of the experiment. In the initial months, free adrenaline basically increased, while in later months blood adrenaline decreased and blood noradrenaline increased. R.E.S.

N80-22969*# National Aeronautics and Space Administration, Washington, D. C.
STATE OF THE BODY IN DISORDERS OF DIURNAL PHYSIOLOGICAL RHYTHMS AND LONG-TERM HYPOKINESIA
S. N. Razin and A. V. Rychko Mar. 1980 7 p Transl. into ENGLISH from Vrach. Delo, no. 5, 1976 p 104-106 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76051) Avail: NTIS HC A02/MF A01 CSCL 06S

In order to study the effects of hypokinesia and circadian rhythm restructuring on the morphological and functional status of the hypothalamo-hypophysic-adrenal system, young male Wistar rats were placed in small cages for varying periods. The animals were decapitated and preparations were made from sections of the brain and adrenals and numerous destructive changes were noted in the investigated regions of the brain, indicating that the condition of these areas is directly affected by disruption of established rhythms in physiological processes. Author

N80-22970*# National Aeronautics and Space Administration, Washington, D. C.
CATECHOLAMINES OF THE ADRENAL MEDULA AND THEIR MORPHOLOGICAL CHANGES DURING ADAPTATION TO REPEATED IMMOBILIZATION STRESS
R. Kvetnansky, A. Mitro, L. Mikulaj, and G. Hocman Mar. 1980 14 p refs Transl. into ENGLISH from Bratislav. Lek. Listy. (Czechoslovakia), V. 46, no. 1, Jan. 1966 p 35-41 Transl. by

Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76068) Avail: NTIS HC A02/MF A01 CSCL 06S

Changes of the adrenal medulla of rats were studied in the course of adaptation to repeated immobilization stress. An increase in the number of cells in the adrenal medulla was found in the adapted animals; this increase was confirmed by weight indices of the medulla and by cell counts per surface unit. Simultaneous karyometric measurements of the nuclei of adrenal medulla cells and an analysis of the catecholamine contents in the adrenals explain the increased activity of the adrenal medulla in the course of adaptation. R.C.T.

N80-22971*# National Aeronautics and Space Administration, Washington, D. C.
VESTIBULAR RECRUITMENT
S. G. Tsamalkhov Mar. 1980 16 p refs Transl. into ENGLISH from Vestn. Otorino-Laringologii (USSR), no. 4, Jul. - Aug. 1979 p 75-83 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76088) Avail: NTIS HC A02/MF A01 CSCL 06P

Vestibular recruitment is defined through the analysis of several references. It is concluded that vestibular recruitment is an objective phenomenon which manifests itself during the affection of the vestibular receptor and thus serves as a diagnostic tool during affection of the vestibular system. R.C.T.

N80-22972*# National Aeronautics and Space Administration, Washington, D. C.
AUTOMATED SYSTEM FOR DIAGNOSING CRANIOCEREBRAL INJURY
N. I. Moiseyeva, G. D. Luchko, R. V. Kremleva, A. V. Morozov, L. I. Nikitina, K. K. Rodionov, A. F. Gurchin, and E. M. Shmatov Mar. 1980 10 p refs Transl. into ENGLISH from Sov. Med. (USSR), no. 10, Oct. 1979 p 94-98 Transl. by SCITTRAN, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76097) Avail: NTIS HC A02/MF A01 CSCL 06B

A Russian national computing and communication system designed to assist non-specialized physicians in the diagnosis and treatment of craniocerebral injury is described. R.E.S.

N80-22973# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
LOW FREQUENCY ACOUSTIC DETECTION IN SUPPORT OF HUMAN DETECTION RANGE PREDICTION Final Report, Sep. 1978 - Sep. 1979
S. A. Fidell, R. D. Horonjeff, and D. M. Green Oct. 1979 88 p refs
(Contract DAAK51-78-C-00133; DA Proj. 1L1-62209-AH-76)
(AD-A080579; BBN-4006; USARTL-TR-79-25) Avail: NTIS HC A05/MF A01 CSCL 06/16

This project resulted in modifications to the acoustic range prediction software that were intended to increase the accuracy with which the program predicts detection ranges for targets that are audible primarily at low frequencies. These modifications were based on interpretations of the findings of a psychoacoustic experiment that sought to determine the effective masking bandwidth for human observers at frequencies as low as 40 Hz. The rationale for this experimentation was based on an extensive search of the masking literature. The possibility that acoustic detection ranges of unaided human observers are affected by infrasonic emissions of helicopters was considered both analytically and empirically. It was concluded from a literature review that the prospects for 'infrasonic cueing' of conventional acoustic detection were doubtful. A two-alternative forced choice task in which infrasound was available as a cue to detection produced results consistent with that conclusion. GRA

N80-22974# Research Inst. of National Defence, Stockholm (Sweden).
PERFORMANCE IN TASKS DIFFERING IN MEMORY LOAD AND ITS RELATIONSHIP WITH HABITUAL ACTIVITY PHASE AND BODY TEMPERATURE
Jan E. Froeberg Apr. 1979 28 p refs
(FOA-C-52002-H6) Avail: NTIS HC A03/MF A01

Twenty-four hour patterns in tasks differing in memory load were studied during a 75 hour vigil. Differences in performance were also studied between morning and evening active subjects, and between body temperature and performance rhythms. The task with a high memory load showed a 24 hr rhythm which was in inverse phase with the less memory loaded task and with body temperature. This was true only for the first 24 hr cycle, after that the memory loaded task tended to follow the other two variables, except in the case of the most extreme morning types for whom the inverse relationship continued to exist. Author (ESA)

N80-22975# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bonn (West Germany). Inst. fuer Flugmedizin.
EVALUATION OF THYROID HORMONES BY GAS CHROMATOGRAPHY
Wolfgang Raabe Jan. 1979 26 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-620)
(DFVLR-FB-79-07) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 7.20

Gas chromatography is discussed as a method to allow routine measurements of thyroid hormone concentration in human serum. It is shown that current methods using this technique are not sufficiently sensitive. A proposal is made to improve the sensitivity of the method by the use of vacuum techniques. A factor of 1000 in sensitivity gain is expected. Author (ESA)

N80-22976# Flying Personnel Research Committee, London (England).
COCKPIT THERMAL STRESS AND AIRCREW THERMAL STRAIN DURING ROUTINE JAGUAR OPERATIONS
T. M. Gibson, L. A. Cochrane, M. H. Harrison, and P. W. Rigden HMSO Mar. 1979 22 p refs
(FPRC/Rept-1376; BR70502) Avail: NTIS HC A02/MF A01

Thermal data were obtained using Jaguar aircraft flying routine, warm weather operations in Sardinia. The data were analyzed in terms of the ambient and cockpit wet bulb, globe temperatures (WBGT), and the mean body temperature (Tb) of the pilot. Relationships described by equations of negative slope, were obtained between Tb and sortie time and between cockpit WBGT and sortie time. MODEL WAS developed for predicting aircrew thermal strain in the Jaguar from cockpit temperature and sortie time. Author (ESA)

N80-22977# Research Inst. for Environmental Hygiene, TNO, Delft (Netherlands). Sound, Light and Indoor Climate Div.
NOISE EFFECTS. EFFECTS OF NOISE EXPOSURE ON BLOOD CIRCULATION AND RESPIRATION OF MAN. PART 1: RESULTS OF A TWO-HOUR NOISE EXPOSURE ON GROUPS OF YOUNGER AND OLDER PEOPLE
A. J. M. Roevekamp and W. Passchier-Vermeer Jun. 1978 123 p refs
(IG-TNO-B-373-E) Avail: NTIS HC A06/MF A01

The influence of noise exposure on blood circulation and respiration was studied. The effects of such noise on the following parameters were examined: heartbeat frequency; absolute impedance plethysmogram; the total alternating current resistance of an extremity (arm, finger); relative impedance plethysmogram; the amplitude of that part of the alternating current resistance of an extremity, which varies with the heartbeat frequency; diastolic and systolic blood pressure and pulse pressure; and respiratory frequency. The results are compared to the effects caused by exposure to traffic noise and by exposure to a constant high sound level. Author (ESA)

N80-22978# National Technical Information Service, Springfield, Va.
EFFECTS OF FATIGUE ON HUMAN BEHAVIOR AND PERFORMANCE. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jan. 1980
Mary E. Young Feb. 1980 205 p Supersedes NTIS/PS-79/0071; NTIS/PS-78/0126; NTIS/PS-77/0064
(PB80-804263; NTIS/PS-79-0071; NTIS/PS-78/0126; NTIS/PS-77/0064) Avail: NTIS HC $30.00/MF $30.00 CSCL 06S

The bibliography cites references on the psychological and physiological effects of mental and physical fatigue. Reports on circadian rhythm, work - rest schedules, sleep deprivation, and physical endurance are included. This updated bibliography contains 198 abstracts, 10 of which are new entries to the previous edition. GRA

N80-22979# National Technical Information Service, Springfield, Va.
BEHAVIOR AND PHYSIOLOGICAL EFFECTS OF NOISE, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Jan. 1980
Mary E. Young Jan. 1980 190 p Supersedes NTIS/PS-79/1014; NTIS/PS-78/0038; NTIS/PS-77/0031; NTIS/PS-76/0014; NTIS/PS-75/103
(PB80-803869; NTIS/PS-79/1014; NTIS/PS-78/0038; NTIS/PS-77/0031; NTIS/PS-76/0014; NTIS/PS-75/103) Avail: NTIS HC $30.00/MF $30.00 CSCL 06S

Research reports are cited on the medical, psychological and physiological problems of noise pollution. Human tolerances to noise from aircraft, community traffic, industry, and military weapons are discussed. Reports on protective measures, noise control and abatement are also included. This updated bibliography contains 183 abstracts, 34 of which are new entries to the previous edition. GRA

N80-22980# National Technical Information Service, Springfield, Va.
BIOLOGICAL EFFECTS OF LASER RADIATION, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Jan. 1978 - Jan. 1980
Elizabeth A. Harrison Jan. 1980 46 p Supersedes NTIS/PS-79/0020; NTIS/PS-78/0036; NTIS/PS-77/0028
(PB80-803935; NTIS/PS-79/0020; NTIS/PS-78/0036; NTIS/PS-77/0028) Avail: NTIS HC $30.00/MF $30.00 CSCL 06R

The bibliography cites reports on radiation injuries, permissible dosage, protective devices, and safety measures. Included are references on the pathology of eye lesions caused by lasers. This updated bibliography contains 39 abstracts, 17 of which are new entries to the previous edition. GRA

N80-22981# National Technical Information Service, Springfield, Va.
COLOR VISION. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jan. 1980
Elizabeth A. Harrison Jan. 1980 202 p Supersedes NTIS/PS-79/0049; NTIS/PS-78/0047; NTIS/PS-77/0039
(PB80-803992; NTIS/PS-79/0049; NTIS/PS-78/0047; NTIS/PS-77/0039) Avail: NTIS HC $30.00/MF $30.00 CSCL 06P

Selected references are presented on defective color vision, genetic characteristics, tests for color blindness, and the use of optical filters in enhancing color images. Reports are included on human engineering for military personnel, pilots, and other operators. Color vision requirements for various occupations are discussed. This updated bibliography contains 195 abstracts, 14 of which are new entries to the previous edition. GRA

N80-22982# Health Effects Research Lab., Research Triangle Park, N. C. Clinical Studies Div.
BIOCHEMICAL CHANGES IN HUMANS UPON EXPOSURE TO OZONE AND EXERCISE
Suzanne Chaney, Paulette DeWitt, Wendy Blowquist, Keith Muller, Robert Bruce, and George Goldstein Aug. 1979 53 p refs
(PB80-105554; EPA-600/1-79-026) Avail: NTIS HC A04/MF A01 CSCL 06S

A total of 44 human subjects were exposed to 784 micrograms/cu m (0.4 ppm) ozone and 30 human subjects were exposed to air as controls. A four hour exposure was given on each of five consecutive days. Half of each group received a higher level of treadmill exercise than the other half. Nine biochemical blood parameters were measured pre and post exposure, red blood cell glutathione reductase, vitamin E, red blood cell cholinesterase, red blood cell glucose-6-phosphate dehydrogenase, lactic acid dehydrogenase, alpha sub I antitrypsin, haptoglobin, complement C3, and igM. Of these variables only vitamin E, red blood cell glucose-6-phosphate dehydrogenase, and complement C3 showed significant changes due to treatment. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-22983 Illinois Univ. at Urbana-Champaign.
MODELS OF HUMAN DECISION MAKING IN MULTI-TASK SITUATIONS: EVENT DETECTION, ATTENTION ALLOCATION, AND IMPLICATIONS FOR COMPUTER AIDING Ph.D. Thesis
Joel Sandor Greenstein 1979 120 p
Avail: Univ. Microfilms Order No. 8009048

Human decision making in multi-task situations is discussed. Mathematical models of human event detection and attention allocation performance in multi-task situations were developed and validated in a specific multiple process monitoring situation. The implications these models have for the design and implementation of computer aided decision making systems are also discussed. Dissert. Abstr.

N80-22984*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THEORY OF THE DECISION/PROBLEM STATE
Duncan L. Dieterly Apr. 1980 21 p refs
(NASA-TM-81192; AFHRL/HB0-104; A-8161) Avail: NTIS HC A02/MF A01 CSCL 05J

A theory of the decision-problem state was introduced and elaborated. Starting with the basic model of a decision-problem condition, an attempt was made to explain how a major decision-problem may consist of subsets of decision-problem conditions composing different condition sequences. In addition, the basic classical decision-tree model was modified to allow for the introduction of a series of characteristics that may be encountered in an analysis of a decision-problem state. The resulting hierarchical model reflects the unique attributes of the decision-problem state. The basic model of a decision-problem condition was used as a base to evolve a more complex model that is more representative of the decision-problem state and may be used to initiate research on decision-problem states. R.E.S.

N80-22985*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROBLEM SOLVING AND DECISIONMAKING: AN INTEGRATION
Duncan L. Dieterly Apr. 1980 20 p refs Prepared in cooperation with Air Force Human Resources Lab., Moffett Field, Calif.
(NASA-TM-81191; AFHRL/HB0-103; A-8160) Avail: NTIS HC A02/MF A01 CSCL 05J

An attempt was made to redress a critical fault of decisionmaking and problem solving research-a lack of a standard method to classify problem or decision states or conditions. A basic model was identified and expanded to indicate a possible taxonomy of conditions which may be used in reviewing previous research or for systematically pursuing new research designs. A generalization of the basic conditions was then made to indicate that the conditions are essentially the same for both concepts, problem solving and decisionmaking. R.E.S.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-22986 Illinois Univ. at Urbana-Champaign.
MODELING THE HUMAN AS A CONTROLLER IN A MULTI-TASK ENVIRONMENT Ph.D. Thesis

Thiruvenkatasamy Govindaraj 1979 139 p
Avail: Univ. Microfilms Order No. 8009046

Two models were developed for the human controller in multitask situations with preview. In the simpler heuristic model, control actions are performed when projected weighted error from the previewed reference exceeds a threshold. The second is a more rigorous analytical model based on optimal control theory. Performance of the model and the subjects are compared in terms of various remote manipulator systems (RMS) measures. For a good match, the RMS lateral error of the model is close to that of the experimental runs. The discrete task performance is compared in terms of RMS differences between the times the subject initiated the discrete tasks and the times the model initiated the corresponding tasks. Results for various experimental conditions are given, and the model match is discussed.

Dissert. Abstr.

N80-22987*# Life Systems, Inc., Cleveland, Ohio.
PERFORMANCE CHARACTERIZATION OF A BOSCH CO SUB 2 REDUCTION SUBSYSTEM Final Report
D. B. Heppner, T. M. Hallick, and F. H. Schubert Feb. 1980 40 p refs
(Contract NAS2-10204)
(NASA-CR-152342; LST-TR-379-11) Avail: NTIS HC A03/MF A01 CSCL 06K

The performance of Bosch hardware at the subsystem level (up to five-person capacity) in terms of five operating parameters was investigated. The five parameters were: (1) reactor temperature, (2) recycle loop mass flow rate, (3) recycle loop gas composition (percent hydrogen), (4) recycle loop dew point and (5) catalyst density. Experiments were designed and conducted in which the five operating parameters were varied and Bosch performance recorded. A total of 12 carbon collection cartridges provided over approximately 250 hours of operating time. Generally, one cartridge was used for each parameter that was varied. The Bosch hardware was found to perform reliably and reproducibly. No startup, reaction initiation or carbon containment problems were observed. Optimum performance points/ranges were identified for the five parameters investigated. The performance curves agreed with theoretical projections. R.E.S.

N80-22988# Bunker-Ramo Corp., Westlake Village, Calif. Electronic Systems Div.
TOTAL AIRCREW WORKLOAD STUDY FOR THE AMST. VOLUME 1: RESULTS Final Report, Mar. 1976 - Nov. 1977
Ralph P. Madero, George A. Sexton, David Gunning, and Richard Moss Wright-Patterson AFB, Ohio AFFDL Feb. 1979 67 p refs 2 Vol.
(Contract F33615-78-C-3614; AF Proj. 2403)
(AD-A076422; AFFDL-TR-79-3080-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 01/3

There is a growing realization within the USAF that state-of-the-art crew systems may allow cost effective reductions in crew complements. The present study, titled the Total Aircrew Workload Study (TAWS) addresses the minimum crew complement required and conceptually, the crew systems required to support the minimum crew of an Advanced Medium STOL Transport (AMST) in the accomplishment of the tactical transport mission. The study involved the simulation of a total tactical airlift mission which was flown by operational (C-130) tactical airlift aircrews in order to further refine crew complement and crew system concepts established in earlier mockup studies. The results of this study indicate that two pilots, a loadmaster and a crew chief type additional crew member can fly the total AMST mission if provided with adequate state-of-the-art crew system capabilities, as identified in this report. The report is presented in two volumes. Volume 1 describes the TAWS program and presents the results. Volume 2 presents a detailed description of the navigation and communication system used during the TAWS evaluation. GRA

N80-22989# Bunker-Ramo Corp., Westlake Village, Calif. Electronic Systems Div.
TOTAL AIRCREW WORKLOAD STUDY FOR THE AMST. VOLUME 2: COMMUNICATION NAVIGATION DESCRIPTION Final Report, Mar. 1976 - Nov. 1977
Ralph P. Madero, George A. Sexton, David Gunning, and Richard Moss Wright-Patterson AFB, Ohio AFFDL Feb. 1979 36 p 2 Vol.
(Contract F33615-78-C-3614; AF Proj. 2403; AF Proj. 6190)
(AD-A076498; AFFDL-TR-79-3080-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 01/3

There is a growing realization within the USAF that state-of-the-art crew systems may allow cost effective reductions in crew complements. The present study, titled the Total Aircrew Workload Study (TAWS) addresses the minimum crew complement required and conceptually, the crew systems required to support the minimum crew of an Advanced Medium STOL Transport (AMST) in the accomplishment of the tactical transport mission. The study involved the simulation of a total tactical airlift mission which was flown by operational (C-130) tactical airlift aircrews in order to further refine crew complement and crew system concepts established in earlier mockup studies. The results of this study indicate that two pilots, a loadmaster and a crew chief type additional crew member can fly the total AMST mission if provided with adequate state-of-the-art crew system capabilities, as identified in this report. GRA

N80-22990# Payne, Inc., Annapolis, Md.
PRELIMINARY ANALYSIS OF WIND TUNNEL TEST OF A 1/2 SCALE MODEL OF AN EJECTING CREWMAN AND EJECTION SEAT Final Report, 15 Sep. 1976 - 30 Sep. 1978
Alastair Anthony May 1979 46 p ref
(Contract F33615-76-C-0530; AF Proj. 7231)
(AD-A069229; AMRL-TR-78-107; Working-Paper-210-8) Avail: NTIS HC A03/MF A01 CSCL 01/3

Doubts were raised as to the integrity of the rest of the structure when the neck member of a model crewman failed during tunnel measurements of the limb forces during ejection. The accuracy of the load estimates used in the pretest stress analysis clearly needed to be checked. Meanwhile, testing was resumed at restricted pressure values with a non-load-measuring replacement for the neck member. From a sampling of the test data, the distribution of bending and torsional moments along the limbs is clearly revealed and with its variation with attitude and Mach number, presents no great surprises. Values critical to the stress analysis confirm the estimated values. The neck pillar, designed by a subcontractor, had been designed for sensitivity in bending under the head loads without catering for torsion in the member if these loads should in the event be appreciably offset from its axis. Although there is little confirmation of the magnitude of the head loads, there is some indication the offsets in excess of one inch in these loads are to be expected in the real situation, and that the resulting torsion was the cause of the failure. GRA

N80-22991# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 75: C-141A AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Jul. 1979 85 p refs
(AF Proj. 7231)
(AD-A079865; AMRL-TR-75-50-Vol-75) Avail: NTIS HC A05/MF A01 CSCL 01/2

The USAF C-141A is a transport aircraft powered by four TF33-P-7 turbofan engines. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for three power conditions. Near-field data are reported for ten locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22992# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK.

VOLUME 120. C-5A AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Jul. 1979 145 p refs
(AF Proj. 7231)
(AD-A079866; AMRL-TR-75-50-Vol-120) Avail: NTIS HC A07/MF A01 CSCL 01/2

The USAF C-5A is a global, strategic airlift aircraft powered by four TF39-GE-1 turbofan engines. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for five engine/power configurations. Near-field data are reported for forty-five locations in a wide variety of physical and psychoacoustic measures: overall and band sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22993# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 121: F-4C AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Apr. 1979 153 p refs
(AF Proj. 7231)
(AD-A079867; AMRL-TR-75-50-Vol-121) Avail: NTIS HC A08/MF A01 CSCL 01/2

The USAF F-4C is an all-weather, supersonic, fighter-bomber aircraft powered by two J79-GE-15 turbojet engines. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for six engine/power configurations. Near-field data are reported for six locations in a wide variety of physical and phychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-Field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distances from the s GRA

N80-22994# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 128: T-38 AIRCRAFT IN THE AF32A-18 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE
Robert A. Lee Jul. 1979 105 p refs
(AF Proj. 7231)
(AD-A079868; AMRL-TR-75-50-Vol-128) Avail: NTIS HC A06/MF A01 CSCL 01/2

The AF32A-18 noise suppressor is made by General Acoustics Corporation for acoustical suppression of the T-38 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for five engine power configurations. Near-field data are reported for four locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22995# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 131: F-4 AIRCRAFT IN THE AF32A-14 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE
Robert A. Lee Feb. 1979 69 p refs
(AF Proj. 7231)
(AD-A079869; AMRL-TR-75-50-Vol-131) Avail: NTIS HC A04/MF A01 CSCL 01/2

The AF32A-14 noise suppressor is made by Koppers Environmental Elements Corporation for acoustical suppression of the F-4 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for three engine power configurations. Near-field data are reported for two locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22996# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 132: F-5 AIRCRAFT IN THE AF32A-16 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE
Robert A. Lee Mar. 1979 69 p refs
(AF Proj. 7231)
(AD-A079870; AMRL-TR-75-50-Vol-132) Avail: NTIS HC A04/MF A01 CSCL 01/2

The AF32A-18 noise suppressor is made by the General Acoustics Corporation for acoustical suppression of the F-5 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for three engine power configurations. Near-field data are reported for two locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22997# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 133: F-15 AIRCRAFT IN THE AF32A-23 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE
Robert A. Lee Jul. 1979 89 p refs
(AF Proj. 7231)
(AD-A079871; AMRL-TR-75-50-Vol-133) Avail: NTIS HC A05/MF A01 CSCL 01/2

The AF32A-23 noise suppressor is made by the Jetway Equipment Corporation for acoustical suppression of the F-15 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for four engine power configurations. Near-field data are reported for locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interferences level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 16 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-22998# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 134. KC-135A AIRCRAFT IN THE MODIFIED AF32A-52A NOISE SUPPRESSOR, FAR-FIELD NOISE
Robert A. Lee Mar. 1979 75 p refs
(AF Proj. 7231)
(AD-A079872; AMRL-TR-75-50-Vol-134) Avail: NTIS

HC A04/MF A01 CSCL 01/2

The AF32A-52A noise suppressor was made by Industrial Acoustics Corporation and modified by the Air Force for acoustical suppression of the KC-135A aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in an AF32A-52A suppressor for three engine power configurations. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for seven acoustic measures as functions of angle and distance from the source. GRA

N80-22998# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.

USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 135: F-106 AIRCRAFT IN THE AF32A-17 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE

Robert A. Lee Nov. 1978 104 p refs

(AF Proj. 7231)

(AD-A079873; AMRL-TR-75-50-Vol-135) Avail: NTIS HC A06/MF A01 CSCL 01/2

The AF32A-17 noise suppressor is made by Jetway Equipment Corporation for acoustical suppression of the F-106 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for five engine power configurations. Near-field data are reported for two locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derived sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-23000# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 136: F-111A AIRCRAFT IN THE AF32A-13 NOISE SUPPRESSOR, FAR-FIELD NOISE

Robert A. Lee Mar. 1979 100 p

(AF Proj. 7231)

(AD-A079874; AMRL-TR-75-50-VOl-136) Avail: NTIS HC A05/MF A01 CSCL 01/2

The AF32A-13 noise suppressor is made by the Industrial Acoustics Corporation for acoustical suppression of the F-111A aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in the AF32A-13 noise suppressor for five power conditions. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for seven acoustic measures as functions of angle and distance from the source. GRA

N80-23001# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 140: F-16 AIRCRAFT IN THE AF32A-25 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE

Robert A. Lee Aug. 1979 87 p

(AF Proj. 7231)

(AD-A079875; AMRL-TR-75-50-Vol-140) Avail: NTIS HC A05/MF A01 CSCL 01/2

The AF-32A-25 noise suppressor is made by the Jetway Equipment Corporation for acoustical suppression of the F-16 aircraft. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating in this suppressor for four engine power configurations. Near-field data are reported for three locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-23002# Defence Research Establishment, Ottawa. (Ontario). Research and Development Branch.

ADDITIONAL STUDIES OF CHEMICALLY TREATED CLOTHING FOR PERSONNEL PROTECTION FROM BITING FLIES

I. S. Lindsay, B. Farnworth, and R. J. Osczenski Nov. 1979 19 p refs

(AD-A080612; DREO-TN-79-28) Avail: NTIS HC A02/MF A01 CSCL 06/17

Combat clothing and wide-mesh hoods treated with the insecticide permethrin have been evaluated for protection against biting flies. Experiments on human subjects indicate excellent protection against mosquitoes from both the clothing and the hoods. Experiments on plastic heads baited with dry-ice indicate moderate protection against blackflies from the hoods whereas the diethyltoluamide (deet) treated hoods gave excellent protection to the uncovered face. GRA

N80-23003# Clemson Univ., S.C. Coll. of Engineering.

EXPERIMENTAL EVALUATIONS OF SELECTED IMMERSION HYPOTHERMIA PROTECTION EQUIPMENT Final Report, 5 Jun. 1978 - 30 Jun. 1979

R. Michael Harnett, Edward M. OBrien, Fred R. Sias, and James R. Pruitt 12 Oct. 1979 172 p refs

(Contract DOT-CG-72074-A)

(AD-A080470; USCG-D-79-79) Avail: NTIS HC A08/MF A01 CSCL 06/17

This report summarizes an experimental test program conducted with state-of-the-art hypothermia protection equipment. Tests included the following attributes: cold-protection effectiveness, mobility reduction, fatigue induction, ease of donning, buoyancy, aesthetic appeal/wearer confidence, flame resistance and reliability. Cold-protection effectiveness is expressed in terms of survival-time estimates for individuals, with selected body structures, wearing the test articles in 1.7 C (35 F) water. The data from these investigations is intended to collectively support the selection of equipment best suited for use by recreational boaters, Coast Guard crewmen and merchant mariners. GRA

N80-23004# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

PROCEEDINGS OF THE FIFTEENTH ANNUAL CONFERENCE ON MANUAL CONTROL Interim Report, Apr. 1978 - Mar. 1979

Frank L. George, ed. Nov. 1979 809 p refs Conf. held at Wright State Univ., Ohio, 20-22 Mar. 1979

(AF Proj. 9994)

(AD-A080563; AFFDL-TR-79-3134) Avail: NTIS HC A99/MF A01 CSCL 05/8

Fifty-six papers were presented during this conference on Manual Control and all are represented, either as complete papers on as abstracts provided by the authors. Topics of the papers include higher order manual tasks involving attention allocation and decision-making, human dynamic modeling and identification, and design methodology for human operator controlled systems. Also covered were aspects of control manipulators and displays, as well as considerations for simulation of human operator-controlled systems. GRA

N80-23005# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

A METHOD FOR SEMI-AUTOMATIC ANALYSIS OF EYE MOVEMENTS

Hans Radke Dec. 1978 33 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-475)

(DFVLR-MITT-79-02) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 7.80

The measurement and analysis of the operator's visual behavior is described in terms of its importance as a tool for human factor research on the layout of displays and controls. However, the analysis of eye-point-of-regard data is difficult and

time consuming. A semi-automatic computer aided procedure is described, which reduces the time needed for data analysis.
Author (ESA)

N80-23008# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
CALIBRATION AND TEST PROCEDURES FOR THREE YEAR OLD CHILD DUMMY Final Report, 1 Feb. 1977 - 1 Nov. 1978
Joseph B. Benson and John W. Melvin 7 Feb. 1979 70 p
(Contract DOT-HS-6-01367)
(PB80-112246; UMICH-HSRI-79-4; DOT-HS-805-070) Avail: NTIS HC A04/MF A01 CSCL 13L

Four three year old child dummies, SA 103C models, were tested to determine the ranges of responses of these dummies in calibration type tests and to refine testing fixtures and techniques. The dummy head accelerometer mounting was revised to reduce ringing, and the ribcage structure attachment modified to eliminate bottoming. A revised loading fixture was designed to facilitate the lumbar spine calibration. The modified dummies produced consistent calibration response data within the proposed limits. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N80-23007*# Stanford Univ., Calif. Inst. for Plasma Research.
UNCERTAINTY IN ESTIMATES OF THE NUMBER OF EXTRATERRESTRIAL CIVILIZATIONS
P. A. Sturrock Mar. 1980 16 p refs
(Contract NGR-05-020-668)
(NASA-CR-162637; SUIPR-808) Avail: NTIS HC A02/MF A01 CSCL 03B

An estimation of the number N of communicative civilizations is made by means of Drake's formula which involves the combination of several quantities, each of which is to some extent uncertain. It is shown that the uncertainty in any quantity may be represented by a probability distribution function, even if that quantity is itself a probability. The uncertainty of current estimates of N is derived principally from uncertainty in estimates of the lifetime of advanced civilizations. It is argued that this is due primarily to uncertainty concerning the existence of a Galactic Federation which is in turn contingent upon uncertainty about whether the limitations of present-day physics are absolute or (in the event that there exists a yet undiscovered hyperphysics) transient. It is further argued that it is advantageous to consider explicitly these underlying assumptions in order to compare the probable numbers of civilizations operating radio beacons, permitting radio leakage, dispatching probes for radio surveillance for dispatching vehicles for manned surveillance. R.C.T.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N80-23008*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VALIDATION METHODS RESEARCH FOR FAULT-TOLERANT AVIONICS AND CONTROL SYSTEMS: WORKING GROUP MEETING, 2
James W. Gault, ed., Kishor S. Trivedi, ed., and James B. Clary, ed. 1980 105 p Meeting held at Hampton, Va. 3-4 Oct. 1979
(NASA-CP-2130; L-13716) Avail: NTIS HC A06/MF A01 CSCL 12A

The validation process comprises the activities required to insure the agreement of system realization with system specification. A preliminary validation methodology for fault tolerant systems documented. A general framework for a validation methodology is presented along with a set of specific tasks intended for the validation of two specimen system, SIFT and FTMP. Two major areas of research are identified. First, are those activities required to support the ongoing development of the validation process itself, and second, are those activities required to support the design, development, and understanding of fault tolerant systems. E.D.K.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N80-23009 California Univ., Los Angeles.
AN ARCHITECTURE FOR AUDITABLE ADVANCED TRANSACTION ORIENTED EDP SYSTEMS Ph.D. Thesis
Roger Dean Schultz 1979 466 p
Avail: Univ. Microfilms Order No. 8008526

Mechanisms for enhancing the auditability of advanced information systems are described. Vendors supply basic hooks to support such mechanisms as a part of the transaction processing operating systems which are used by enterprises as a basis for their advanced systems. The mechanism is composed of two parts: a programmable evidence capsule mechanism called the audit probe, and an interactive programmable evidence analysis part called the auditor's assistant. The audit probe borrows from the concepts of software probes used in performance monitoring, and is defined using a high level language. The evidence analysis portion of the mechanism provides planning and evidence evaluation support. It also documents the audit process, providing automatic working papers for the auditor, as well as many of the features currently provided by generalized audit software. Various implementation and performance issues concerning the audit probe approach are investigated.
Dissert. Abstr.

N80-23010 Duke Univ., Durham, N. C.
PERFORMANCE-ORIENTED DESIGN MODELS FOR COMPUTER SYSTEMS Ph.D. Thesis
Timothy Miller Sigmon 1979 152 p
Avail: Univ. Microfilms Order No. 8008194

Several performance-oriented design models are presented which can be used to aid computer system designers by generating intial system design for an iterative design process or by allowing the investigation of many different system configurations quickly and inexpensively. The design models are based on an exponential queueing network model of the desired system configuration upon which an optimization problem has been superimposed. For each design model, it is shown that the optimization problem is a convex programming problem and therefore any locally optimal solution is a global optimum. Numerical examples are provided for each design model which demonstrate how these models might be used. The examples also show that not only are these design models computationally tractable but they also quite efficient.
Dissert. Abstr.

N80-23011 California Univ., Los Angeles.
A STUDY OF PARALLEL PROCESSING ARCHITECTURE FOR COMPUTER SIMULATION OF PLASMAS Ph.D. Thesis
Li-Ping-Thomas Wang 1979 537 p
Avail: Univ. Microfilms Order No. 8008550

A candidate methodology which is intended to help model suitable computer architectures for a target system, and is particularly beneficial for the design of parallel processing systems is discussed. A particular example is examined that of plasma particle simulation of synchrotron radiation. Results from the computer simulation of a two-and-one-half dimensional relativistic electromagnetic particle model for a plasma are obtained and checked against those from mathematical computation. Several large scale computer configurations are presented and their

performance comparison is made on the base of a one-million particle simulation run of the simulation model. Dissert. Abstr.

N80-23012# Ohio State Univ. Research Foundation, Columbus.
EPITAXIAL MAGNETIC FILM EVALUATION TECHNIQUES Interim Report, 1 Nov. 1977 - 31 Oct. 1978
Philip E. Wigen and Kenneth J. Breeding Wright-Patterson AFB, Ohio AFAL Nov. 1979 113 p refs
(Contract F33615-77-C-1002; AF Proj. 2305)
(AD-A080390; OSURF-764596/710525; AFAL-TR-79-1145) Avail: NTIS HC A06/MF A01 CSCL 09/2

This annual report reviews the progress of the second year of work on magnetic bubble materials and the testing of bubble memory devices. At the Avionics Laboratory, an M-H looper device was built for use in characterizing bubble materials. The device is fully automated (employing a Hewlett-Packard calculator system) and for use with whole wafers of bubble material. Details of the looper along with samples of data taken are included in the report. At the OSU Physics department, two types of domain wall phenomena were investigated. Propagation of spin waves through domain walls at microwave frequencies were investigated both theoretically and experimentally. Secondly domain wall motion excited with a radio frequency magnetic field oriented parallel to the film plane was studied. GRA

N80-23013# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DATA FLOW TECHNIQUES IN SINGLE-USER MULTIPROCESSOR SYSTEMS M.S. Thesis
Brian P. Boesch Dec. 1979 103 p refs
(AD-A080174; AFIT/GE/EE/79-7) Avail: NTIS HC A06/MF A01

Problems associated with performing computation tasks in single-user microprocessor environments are discussed. Data flow methods are investigated as a means of applying multiprocessors to this environment. An event driven simulation of a variable architecture data flow processor is developed, using UCSD PASCAL (TM). A trial data flow multiprocessor using 8080 based microprocessors is developed and tested. Using the simulator and information gathered from the trial multiprocessor, several situations typical to single user systems were tested. Maximal levels of parallel processing are presented for a variety of situations. GRA

N80-23014# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SYSTEM DESIGN TOOL FOR AUTOMATICALLY GENERATING FLOWCHARTS AND PREPROCESSING PASCAL M.S. Thesis
James Howard Keller Dec. 1979 116 p refs
(AD-A080418; AFIT/GCS/EE/79-7) Avail: NTIS HC A06/MF A01 CSCL 09/2

The portion of overall system costs attributable to software development and maintenance is presently near 50 percent and is continually increasing. Programmers and analysts are diligently searching for tools to assist them by automating the analysis, design, and documentation of software systems. Flowcharting has lost some of its support as a powerful design tool due to the need for discipline, patience, and to some degree artistic talent. Automatic flowcharting, designed for specific languages and machines, provides automatic documentation only. No attempt has been made to link the automatic flowcharting to the compiler-ready code. This study begins the development of an automatic program design tool to grapically display and update flowcharts and provide this link between the flowchart and the system it represents. A method of detailed, automatic design of programs, down to the elemental source language level, is proposed which displays graphical flowchart constructs and provides for iterative, stepwise refinements of the flowcharts. The final system, is maintained in a data structure that allows for subsequent refinement and for optionally producing a compiler-ready source listing. GRA

N80-23015# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A GRAPH MODEL REPRESENTATION OF A DISTRIBUTED PROCESSOR COMPUTER SYSTEM M.S. Thesis
Leslie A. Palmer Dec. 1979 150 p refs
(AD-A080410; AFIT/GCS/EE/79-12) Avail: NTIS HC A07/MF A01 CSCL 09/2

Every computer system is designed to perform a certain function or set of functions. The most accurate way to evaluate a system's performance is to measure the system under its real workload (Ref 32:19). Very often, though, it is not feasible or practical to measure an existing system (Ref 5:12). When the system to be analyzed is not available for direct analysis, a model of the system can serve as the subject of analysis. This investigation focuses on the use of a particular class of graph models, known as Evaluation-Nets, to model a distributed processor computer system in support of a performance analysis effort GRA

N80-23016# Iowa Univ., Iowa City. Dept. of Electrical and Computer Engineering.
TEST PROCEDURES FOR SEMICONDUCTOR RANDOM ACCESS MEMORIES Final Technical Report, Jul. 1978 - Apr. 1979
Sudhakar M. Reddy and D. S. Suk Griffiss AFB, N. Y. RADC Nov. 1979 105 p refs
(Contract F30602-78-C-0083; AF Proj. 2338)
(AD-A080450; RADC-TR-79-269) Avail: NTIS HC A06/MF A01 CSCL 09/2

Currently available memory testing algorithms were reviewed and evaluated to assess their inadequacies in testing large scale integrated circuit random access memories (RAMs). Categories of functional faults were proposed to include several types of coupling faults. A neighborhood for pattern sensitive faults was defined. A fault model for stuck-at failures in dynamic RAMs was derived, as were requirements to detect abnormal timing parameters. Procedures to detect the following classes of faults were then developed: (1) functional faults, (2) neighborhood pattern sensitive faults, (3) stuck-at faults in dynamic RAMs, and (4) abnormal access times. GRA

N80-23017# Rome Air Development Center, Griffiss AFB, N.Y.
A PLAN FOR AN AUTOMATED MANAGEMENT INFORMATION SYSTEM Final Report
Donald I. Zulch, Frank Rehm, Stephen Gross, Sharon Keplesky, Dennis Maynard, Richard Gaudino, and G. Lamperti Dec. 1979 84 p
(AF proj. 9991)
(AD-A080137; RADC-TR-79-271) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report documents the results of an in-depth analysis of the management data bases that presently exist at RADC and defines a plan for achieving a fully automated management information system (MIS). A concept of a principal task is proposed and is defined. A method of achieving a smooth transition from the current data base structure to an automated MIS with on-line data entry and retrieval is suggested and finally a management structure supporting the MIS implementation is suggested. GRA

N80-23018# Ohio State Univ., Columbus. Computer and Information Science Research Center.
THE POST PROCESSING FUNCTIONS OF A DATABASE COMPUTER
David K. Hsiad and Jaishankar Menon Jul. 1979 38 p refs
(Contract N00014-75-C-0573)
(AD-A080128; OSU-CISRC-TR-79-6) Avail: NTIS HC A03/MF A01 CSCL 09/2

DBC is a specialized back-end computer which is capable of managing database of 10 to the 10th power bytes in size and supporting known data models such as relational, network, hierarchical and attribute-based. This report deals with the post processing functions of DBC. A description of some known methods for performing natural and implicit joins is first given. It then goes on to show how both natural and implicit joins are performed by the post processor (PP) of DBC utilizing the parallelism of PP. This report show that the algorithm for performing joins is of O(N) time, where N is the number of records to be joined. Algorithms necessary for performing set functions such as maxima, minima, average, sum and count are given. The time complexities of these algorithms are also calculated. Finally, it is shown how to implement the set inclusion operator. Given a set of values for a particular attribute and a number of retrieved records, this operator can select those

records whose values for the attribute are the values in the set. GRA

N80-23019# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MIME: MICROPROGRAMMABLE MINICOMPUTER EMULATOR, PHASE 2, VOLUME 2 M.S. Thesis
Thomas R. Hoyt and Dean A. Myers Dec. 1979 252 p refs Revised 2 Vol.
(AD-A080420; AFIT/GCS/EE/79-11-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 09/2
Contents: MIME User's Manual; MIL-STD-1750 Emulation Reference Manual; MIME Translator Reference Manual; and MIME Modest Monitor (MIME/MM) User Manual. GRA

N80-23020# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MIME: MICROPROGRAMMABLE MINICOMPUTER EMULATOR, PHASE 2, VOLUME 1 M.S. Thesis
Thomas R. Hoyt and Dean A. Myers Dec. 1979 94 p refs 1 Vol.
(AD-A080360; AFIT/GCS/EE/79-11-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes software and hardware enhancements made to an existing educationally oriented microprogrammable minicomputer (MIME) that was implemented using the Am2900 series of integrated circuits. Hardware changes included extensions of the machine architecture by incorporation of user-definable fields in the microword, corresponding to user-definable capabilities in the hardware. A microprogramming language was developed for the machine, as well as a translator. The instruction set of MIL-STD-1750, Airborne Computer Instruction Set Architecture was microprogrammed to demonstrate the utility of the translator and the computer. MIL-STD-1750 peculiar hardware was interfaced through the user-definable portion of the architecture. The results showed that a minicomputer instruction set could be successfully emulated using MIME. The final system of hardware, software, and documentation provides a valuable educational tool for studies of microprogramming, emulation, and computer control. GRA

N80-23021# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EMITTER DATA MAINTENANCE AND RETRIEVAL SYSTEM M.S. Thesis
Clifford C. Gardner Dec. 1979 152 p refs
(AD-A080416; AFIT/GCS/EE/79-5) Avail: NTIS HC A08/MF A01 CSCL 05/2

The purpose of this thesis was to design and implement a system which maintained and processed electronic emitter data. The successful completion of this project resulted in a product which accomplishes the required tasks. The initial phase of the project was the requirements analysis. The technique used for this phase (Structured Analysis) proved to be only partially successful. It was only used at a very high level. For larger projects where more communication is necessary among designers and with users, it would be more beneficial. It was useful as a means of organizing the ideas of the designer, but the user/designer interaction was accomplished without the data flow diagrams. Familiarizing the user with the technique would be more productive on a larger project. The Structured Design technique used during the design specification stage was of greater value. It proved to be a very organized and effective method of taking a general task and breaking it into modules which could be easily coded and maintained. Even small software projects such as this can benefit from this or similar techniques. The choice of a programming language which encourages structured coding proved a wise decision. PASCAL is a highly readable language. While only an outside observer can determine how readable the resulting product is, the designer found debugging to be much simpler than expected. GRA

N80-23022# Naval Postgraduate School, Monterey, Calif.
MICROCOMPUTER DESIGN FOR ELECTRIC EMITTER INDENTIFICATION M.S. Thesis
Gary Lew Bush Sep. 1979 66 p refs
(AD-A081063) Avail: NTIS HC A04/MF A01 CSCL 17/4

New technological advances in weapons and electronics has increased the fighting capabilities of small ships. The increases are seen in better and lighter offensive weapons, along with increases in self-defensive weapons through the addition of electronic suites. The electronic warfare suites currently used on small ships are limited in size, weight, and response time because of the environment in which these ships are employed. It is the purpose of this paper to propose a system which will allow the currently very limited data bases to be expanded while at the same time not degrading the system. The feasibility of this approach is based upon using a microcomputer to aid in the identification of emitters off-line while leaving the current system to identify high threat emitters. GRA

N80-23023# European Space Agency, Paris (France).
THE USE OF DIGITAL INTEGRATORS, PARTICULARLY DIGITAL DIFFERENTIAL ANALYZERS, IN PROCESS CONTROL COMPUTERS
Rudolf Freitung Jul. 1979 79 p refs Transl. into ENGLISH of "Einsatz von Digitalen Integrierern in Prozessrechnern unter Besonderer Beruecksichtigung von Inkrementerechenschaltungen (DDA)", Rept. DLR-FB-77-71 DFVLR, Brunswick, Jan. 1978 Original report in GERMAN previously announced as X79-72229
(ESA-TT-533; DLR-FB-77-71) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 38.90

The principle of digital integrators is explained using a practical example, and the fundamentals of digital differential analyzers are treated. Several simple integration algorithms which take only a few program steps in digital computation and which are useful for digital differential analysers are reviewed. The error due to the integration algorithm chosen is shown in some applications to feedback systems. Some realizations of digital integrators for the simulation of dynamic systems are given for use in a programmable digital computer, as well as for use in hardware computing elements. Author (ESA)

N80-23024# National Technical Information Service, Springfield, Va.
PARALLEL PROCESSORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jan. 1980
Brian Carrigan Feb. 1980 290 p Supersedes NTIS/PS-79/0012; NTIS/PS-78/0016; NTIS/PS-77/0024
(PB80-804313; NTIS/PS-79/0012; NTIS/PS-78/0016; NTIS/PS-77/0024) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

Two hundred and eighty-three citations from federally funded research on the design, development, and application of parallel processors are presented. The development of numerical techniques for parallel processing, scheduling parallel processors, and parallel processing of various kinds of scientific data are included. The development of algorithms and computer programs is also covered, as are specific studies on ILLIAC computers. GRA

N80-23025# National Technical Information Service, Springfield, Va.
PARALLEL PROCESSORS, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977 - Jan. 1980
Brian Carrigan Feb. 1980 273 p Supersedes NTIS/PS-79/0013, NTIS/PS-78/0018 and NTIS/PS-77/0025
(PB80-804321; NTIS/PS-79/0013; NTIS/PS-78/0018; NTIS/PS-77/0025) Avail: NTIS HC $30.00/MF $30.00 CSCL 09B

The bibliography cites worldwide research on the design, development, and application of parallel processors. Studies are included on the development of numerical techniques for parallel processing, scheduling parallel processors, and parallel processing of various kinds of scientific data. The development is also included, as are specific studies on ILLIAC computers. This updated bibliography contains 269 abstracts, 105 of which are new entries to the previous edition. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N80-23026 Wisconsin Univ. - Madison.
COMPLEMENTARITY IN MATHEMATICAL PROGRAMMING Ph.D. Thesis
Wayne Phillip Hallman 1979 147 p
Avail: Univ. Microfilms Order No. 8004721

The two mathematical programming problems are considered where the complementarity condition arises. The first problem studied is the complementary programming problem which is obtained by adding the complementarity condition into the constraints of a linear programming problem. Some applications of the complementary programming problem are presented, and the relationship between this problem and the mixed integer programming problem is discussed. The other problem studied is the linear complementarity problem. A method is proposed for solving a general linear complementarity problem where no assumptions are required on the problem data. The algorithm is based on the branch-and-exclude principle and is a modification of the branch-and-bound algorithm for the complementary programming problem. Dissert. Abstr.

N80-23027 Alabama Univ. in Birmingham.
SIMULATION STRATEGIES: A THEORETICAL AND PRACTICAL INVESTIGATION Ph.D. Thesis
James William Hooper 1979 305 p
Avail: Univ. Microfilms Order No. 8007879

An approach to alleviating the dual problems of simulation language inadequacy and simulation language proliferation is investigated. The approach is to merge two popular languages, providing the means to process models written in either language alone, or containing features of both languages. In order to devise a means to merge the languages, an in depth investigation of discrete event simulation strategies was conducted. Three recognized simulation strategies are described: event scheduling, activity scanning, and process interaction. Algorithms are formulated for each strategy and a detailed comparison of the strategies is given, based on the algorithms. To provide an approach to merging the two languages, the algorithms for the respective strategies (process interaction and event scheduling) are merged into one algorithm. A prototype processor is evaluated. Dissert. Abstr.

N80-23028 Northwestern Univ., Evanston, Ill.
A SYSTEMS APPROACH TO SOFTWARE DESIGN REPRESENTATION Ph.D. Thesis
Leon John Meldy 1979 214 p
Avail: Univ. Microfilms Order No. 8007395

The software engineering problem is approached recognizing that any design is the process of building a representation of an object to be created, and therefore, the right form of design representation is considered to be the main instrument necessary for the integration of essential mathematical and engineering concepts into the software design process. The main goal of this work is the development of a particular scheme of software design representation which is similar to the blueprint concept of the mature engineering professions. Special attention is given to the important notion that a design representation is not just a form of specification, description, or documentation, but a formal engineering model of the system's functional and structural aspects. The graphical-analytical simplicity of a representation scheme is considered to be the key feature for the effective construction and analysis of system models. Dissert. Abstr.

N80-23029 State Univ. of New York at Stony Brook.
TOWARD A THEORY OF PROGRAM SYNTHESIS: AUTOMATING IMPLEMENTATIONS OF ABSTRACT DATA TYPES Ph.D. Thesis
Pasupathi Ananta Subrahmanyam 1979 326 p
Avail: Univ. Microfilms Order No. 8009594

The development of a basis for a theory of program synthesis, proceeding from formal specifications of problems in the form of abstract (algebraic) data types. The problem considered is that of automating the implementation of a formally specified type of interest in terms of a target type (or a set of target types) for which the implementations are presumed to be available. The task of program synthesis is approached in a general algebraic framework, and has adequate flexibility to allow for various forms of optimizations to be applied at different stages of the synthesis process. The main tools used to obtain implementations are type composition, syntactic pattern-matching, and the semantic specifications of the functions defined on the type. Syntactically guided synthesis strategies are also investigated; these consist of hypothesizing implementations based purely on the syntactic specifications of functions. Dissert. Abstr.

N80-23030# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
A T = O(2N/2), S = O(2/4) ALGORITHM FOR CERTAIN NP-COMPLETE PROBLEMS
R. Schroeppel and Adi Shamir Jan. 1980 26 p refs
(Contract N00014-76-C-0366)
(AD-A080385; MIT/LCS/TM-147) Avail: NTIS
HC A03/MF A01 CSCL 09/4

A general purpose algorithm that can solve a number of NP-complete problems in time T=o (2 to the n/2 power) and space S=(2 to the n/4 power) is presented. The algorithm can be generalized to a family of algorithms whose time and space complexities are related by T times S squared = o (2 to the nth power). The problems it can handle are characterized by few decomposition axioms, and they include knapsack problems, exact satisfiability problems, set covering problems, etc. The new algorithm has a considerable significance, since it can break knapsack-based cryptosystem with up to n= 100 generators.
R.C.T.

N80-23031# Naval Research Lab., Washington, D. C.
FLEX: A FLEXIBLE, AUTOMATED PROCESS DESIGN SYSTEM Final Report
Stephen A. Sutton and Victor R. Basil Nov. 1979 30 p refs
(RR0230345)
(AD-A079312; AD-E000345; NRL-8349) Avail: NTIS
HC A03/MF A01 CSCL 09/2

The FLEX Design System is a software design language and its processor that together form a tool for use in computer software development activities. The system combines features originating in earlier Process Design Languages (PDLs) with many features found in modern programming languages. The system is quite flexible and can be adapted to different programming environments; in effect the language can be configured to produce a family of less flexible PDLs. Among the features offered by the FLEX language are: a modular design structure, type abstraction, definable operators, generic routines, strong type checking, consistency checking of all functional interfaces, and protection of selected data from alteration in certain environments. GRA

N80-23032# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE GENERATION OF INPUT DATA USING INTERACTIVE COMPUTER GRAPHICS M.S. Thesis
Alan R. Miller Dec. 1979 136 p refs
(AD-A080171; AFIT/GCS/MA/79D-2) Avail: NTIS
HC A07/MF A01 CSCL 09/2

The Air Force Avionics Laboratory utilizes a digital computer model of an air defense command and control system in its analysis programs. The model is quite large and requires an extensive input data set, of which approximately 80 percent is used to define the ground defense environment. Current techniques for preparation of the input data are totally manual, requiring many hours of tedious site preparation, data transcription, and keypunching. This paper presents a completely new approach to the preparation of the ground defense environment data. A system of three computer programs is identified that provides an automated process for converting basic site parameterization data into the required format for input to the model. An interactive computer graphics program is the core of the system and the principal vehicle through which all data modification and assignment actions occur. State-of-the-art concepts in software engineering, data storage and retrieval, and man-machine communication techniques are incorporated which enable early detection of erroneously defined data, increase the quality and

timeliness of the final product, and improve overall system maintainability. GRA

N80-23033# Utah Univ., Salt Lake City. Dept. of Electrical Engineering.
SOFTWARE RELIABILITY ESTIMATION UNDER CONDITIONS OF INCOMPLETE INFORMATION Final Technical Report, 1 Apr. 1978 - 1 Apr. 1979
C. K. Rushforth, F. L. Staffanson, and A. E. Crawford Griffiss AFB, N. Y. RADC Oct. 1979 92 p refs
(Contract F30602-78-C-0025; AF Proj. 2528)
(AD-A080432; UTEC-79-063; RADC-TR-79-230) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes a computer program for the estimation of the reliability of large software packages. A model is developed which incorporates additional features found in realistic testing environments. The model is analyzed for deterministic data. Performance on simulated random test data is presented. The algorithm estimates the parameters of the model from software error data, and computes therefrom running estimates of the mean-time-to-failure and the number of software errors remaining. GRA

N80-23034# Ohio State Univ. Research Foundation, Columbus. Dept. of Computer and Information Science.
TRANSLATION OF PHRASE STRUCTURED PROGRAMMING LANGUAGES Final Report, 1 May 1975 - 30 Jun. 1979
William Buttelmann Dec. 1979 15 p refs
(Grant AF-AFOSR-2811-75; AF Proj. 2304)
(AD-A080100; OSURF-760242/784151; AFOSR-80-0088TR)
Avail: NTIS HC A02/MF A01 CSCL 09/2

An integrated formal theory of phrase structure linguistic descriptions has been developed, based on classical phrase linguistic theory and on a new formal theory of phrase structure semantics developed by this research project. The theory provides for both context-sensitive syntax and semantic structure, interpretations, the meaning of certain linguistic entities such as morphemes, phrases, sentences, and statements, and specifies the nature of and relationship between syntactic and semantic ambiguity. The theoretical model of syntax and semantics was developed in order to study the computational aspects of semantic interpreters and language translators. Based on the model, a theory of interpretation and translation was constructed, and a number of results in these two areas have been developed. It was shown how linguistic properties can be treated either as context-sensitive or context-free and either as semantic or syntactic information. This theory establishes the basis for further research into the computational complexity of semantic interpreters and especially into the problem of minimizing the complexity of interpreters by proper trade-offs between syntax and semantics and/or 'context-sensitive'-ness and 'context-free' GRA

N80-23035# Pattern Analysis and Recognition Corp., Rome, N. Y. Pattern Analysis and Recognition Corp.
MULTICS REMOTE DATA ENTRY SYSTEM, VOLUME 1
David Birnbaum, John J. Cupak, Jr., Janet D. Dyar, and Richard Jackson Griffiss AFB, N.Y. RADC Oct. 1979 260 p refs
(Contract F30602-77-C-0174; AF Proj. 5597)
(AD-A080625; PAR-79-59-Vol-1; RADC-TR-79-265-Vol-1)
Avail: NTIS HC A12/MF A01 CSCL 09/2

This report contains the user's manuals and software documentation for the Remote Data Entry System which is the front-end to the MULTICS Pattern Recognition Facility and the Cluster Analysis package which was added to MULTICS OLPARS. The Remote Data Entry System was designed to allow users of the MULTICS Pattern Recognition Facility the ability to input their data over the ARPANENT from a Tektronix remote storage device. Once the data is input into the MULTICS System, routines are provided so that the user can easily restructure or cluster his database to perform different classification experiments. Author (GRA)

N80-23036# Pattern Analysis and Recognition Corp., Rome, N. Y. Pattern Analysis and Recognition Corp.
MULTICS REMOTE DATA ENTRY SYSTEM. VOLUME 2: CLUSTERING ADDITIONS TO MOOS
Janet D. Dyar Griffis AFB, N.Y. RADC Oct. 1979 98 p
(Contract F30602-77-C-0174; AF Proj. 5597)
(AD-A080626; PAR-79-53-Vol-2; RADC-TR-79-265-Vol-2)
Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes the clustering algorithms added to the MULTICS OLPARS Operating System under this effort. GRA

N80-23037# California Univ., Livermore. Lawrence Livermore Lab.
DISCUSSION OF MACRO CAPABILITIES IN FORTRAN
Jeanne T. Martin Sep. 1979 17 p refs Presented at the FORTRAN Experts Meeting ISO/TC97/SC5, Turin, 12-16 Nov. 1979
(Contract W-7405-eng-48)
(UCRL-83306; CONF-791111-1) Avail: NTIS HC A02/MF A01

The advantages of adding a macro capability to FORTRAN are propounded. The necessary syntactic features are discussed and the utility of such a capability is illustrated through the use of examples. A particular syntactic mechanism is employed for illustrative purposes. It permits a programmer to define syntax appropriate to an application. DOE

N80-23038# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE EVALUATION OF LINEAR ALGEBRA SOFTWARE IN PARALLEL ARCHITECTURES
Thomas L. Jordan Oct. 1979 30 p refs
(Contract W-7405-eng-36)
(LA-8078-MS) Avail: NTIS HC A03/MF A01

Performance data of parallel computers on several of the problems of linear algebra using direct methods are provided. The computers considered include software pipeline, hardware pipeline, single-instruction multiple-data, and multiple-instruction multiple-data. Special features of each architecture are considered. Factors such as start-up time, scalar-vector break-even points, consistency in operation count, parallel steps required, and speed-up and efficiency of the hardware are discussed. A reasonably broad comparison is given for LU factorization without pivoting. A less extensive comparison is given for LU factorization with pivoting. Also various intracomputer comparisons are presented to show the performance of different implementations of a particular algorithm as well as the performance of different algorithms for solving the same problem. Data were collected for the linear algebraic problems of matrix multiplication, regular sparse systems (including tridiagonal systems and dissection techniques), and random sparse systems. DOE

N80-23039# Royal Aircraft Establishment, Farnborough (England).
A FREE-FORMAT DATA INPUT SCHEME WRITTEN IN FORTRAN 4
G. F. Butler and J. Pike London HMSO May 1979 43 p
(RAE-TM-Aero-1804; BR69582) Avail: NTIS HC A03/MF A01

A data input scheme which uses FORTRAN 4 and which makes the minimum amount of demands on the data structure is described. The scheme allows input variables to retain their previous values, identical consecutive data to be input in a simplified form, and alphanumeric comments to appear among the data. Details of the data input scheme and the computer programs are discussed. Author (ESA)

N80-23040# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
COST ESTIMATION AND MANAGEMENT CONTROL OF SOFTWARE DEVELOPMENT IN SCIENTIFIC/TECHNICAL PROJECTS
U. Posthuma deBoer 31 May 1979 150 p refs
(Contract NIVR-1831)
(NLR-TR-78056-U) Avail: NTIS HC A07/MF A01

Cost estimation of software development and the monitoring and control of factors which affect the development cost is considered. The lack of uniformity in the development approach, the lack of a standard terminology and the limited, difficult to access, cost data bases are included. A cost estimation approach is presented together with a survey of factors affecting the cost of software development, illustrated with figures. To keep these cost factors manageable, a configuration management system is

proposed, partly based on procedures and tools already in use for hardware development. Procedures and tools for software configuration management and for related aspects as software testing are described and illustrated with examples from software development projects. Author (ESA)

N80-23041# Research Inst. of National Defence, Stockholm (Sweden).
DESIGN SPECIFICATION FOR DATALAB: A SYSTEM FOR DATA ANALYSIS BASED ON RELATIONAL MODEL OF DATA
Stefan Amborg, Eva Elvers, and Per Svensson Nov. 1979 232 p refs
(FOA-C-20326-08) Avail: NTIS HC A11/MF A01

The design documentation for a proposed interactive program system, Datalab, intended for data analysis applications in science, technology, and management is presented. The kernel of the system is a relational database subsystem permitting the evaluation of queries expressed in a relational algebra query language. Onto this kernel are added several subsystems which serve to enhance the analytic power of the system, to simplify its use, and to ensure the security of its database. The system is functionally extensible, in the sense that additions to the standard set of application programs can be made by a programmer user. Author (ESA)

62 COMPUTER SYSTEMS

Includes computer networks.

N80-23042 California Univ., Los Angeles.
SEGMENTATION OF THE DOMAIN OF DISTRIBUTED PARAMETER SYSTEMS Ph.D. Thesis
Kofi Apenyo 1979 242 p
Avail: Univ. Microfilms Order No. 8008455

A method based on pattern recognition principles is presented for the segmentation of the domain of distributed parameter systems. The proposed methodology involves the design of a region growing system. An important assumption is that a relationship between system observations and the underlying regions exists. Thus a theoretical formulation for the property of a pattern in the form of numerical measurements of the dynamic model response is considered. The decision phase of the pattern recognition system design consists of a threshold element which determines the membership of a pattern in one of the underlying regions. The segmentation ability of the system design is investigated by computer simulation of a water quality system. Quantitative measures which estimate the performance of the region grower are developed and used to demonstrate the feasibility of applying the methodology to realistic distributed parameter systems. Dissert. Abstr.

N80-23043 Princeton Univ., N. J.
MODELING OF MULTI-MICROCOMPUTER NETWORKS Ph.D. Thesis
Hikyu Lee 1979 160 p
Avail: Univ. Microfilms Order No. 8008943

The network geometry for multi-microcomputer interconnection is described by an undirected graph. The nodes represent microcomputers with associated local memory and the edges are bi-directional communication links. Network geometries represented by a family of regular graphs, called chordal ring, high level chordal ring and multi tree structured graphs are described and analyzed. Analytic and computational results on these graphs are obtained. A specialized multichain, multiclass, network of queues model is developed. Statistics on the performance measures, such as processor utilization, mean response time, and concurrency are obtained for an example model of a 10 node system. Dissert. Abstr.

N80-23044# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PROTOTYPE UNIVERSAL NETWORK INTERFACE DEVICE M.S. Thesis
Eric Frederick Brown Dec. 1979 88 p refs
(AD-A080173; AFIT/GE/EE/79-8) Avail: NTIS HC A05/MF A01 CSCL 17/2

The thesis describes a prototype version of a flexible message processor designed for computer communications network applications. This message processor is microcomputer based and is called a Universal Network Interface Device. The thesis describes the operational features and construction details of the three cards, which were developed in the construction of the prototype device. These three cards are used with two microcomputer boards and a memory board to provide the capability to interface local users to a computer communications network. The device also provides the capability to act as the node connecting two networks operating under dissimilar protocols. GRA

N80-23045# California Univ., Livermore. Lawrence Livermore Lab.
LIMITING THE LIFETIME OF PACKETS IN COMPUTER NETWORKS
Lansing J. Sloan 16 Aug. 1979 7 p refs Proceedings of the 4th Conf. on Local Computer Networks, Minneapolis, 22-23 Oct. 1979; sponsored by IEEE Computer Soc.
(Contract W-7405-eng-48)
(UCRL-82825; CONF-791023-1) Avail: NTIS HC A02/MF A01

The assurance mechanisms of protocols used in packet switching computer networks, the maximum lifetime of packets being transported from source to destination and subsequent reliability problems are discussed. A method is presented that ensures that a packet is delivered only if its age does not exceed a guaranteeable maximum packet lifetime. The method requires knowledge of the time a packet spends on a logical link; a mechanism to measure this time can be, and should be, added to existing link-level protocols. Such a mechanism is presented and its addition to a standard link-level protocol is shown. DOE

N80-23046# California Univ., Livermore. Lawrence Livermore Lab. Biomedical Sciences Div.
PLANNING THE EVOLUTION OF A LABORATORY COMPUTER NETWORK
Tom Slezak 28 Aug. 1979 19 p Presented at MODCOM Users Soc. Conf. Miami, 3-6 Dec. 1979
(Contract W-7405-eng-48)
(UCRL-83061; CONF-791206-1) Avail: NTIS HC A02/MF A01

One consequence of the rapid decline of computer prices is the growth of loosely connected, relatively unplanned computer networks. In research installations, independently funded groups often acquire their own minicomputers and interconnect them as the need arises. If there are several groups working on problems in proximity, similar networks usually result. An unstructured network is examined, and a long-range growth plan that can be used at various levels of management is presented. The situation is illustrated by the example of the LLL Biomedical Sciences Division's computer network. DOE

N80-23047# European Space Agency, Paris (France).
LINK INVARIANT LINE PROGRAMS IN COMMUNICATION SYSTEMS
Franz Josef Buchberger Mar. 1979 101 p refs Transl. into ENGLISH of "Anschlussinvariante Leitungsprogramme in Kommunikationssystemen", Rept. DLR-FB-77-38 DFVLR, Oberpfaffenhofen, West Germany Feb. 1977 Original report in GERMAN previously announced as X79-71675
(ESA-TT-501-Rev; DLR-FB-77-38) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 42.30

Starting with the term 'communications system' a general introduction to the field of communications operating systems is given. By two examples, the operational program of the Interface Message Processors (IMPs) and TIPS, (Terminal IMPS) in the ARPA computer network and the operating system SOHO, it is shown in detail how communications operating systems can be constructed. The line programs are the object of particular consideration. The terms 'simple', 'copied', and 'link invariant' line programs are defined, and the advantages and disadvantages of these types of line programs are discussed. The implementation of link invariant line programs in the operating system SOHO is described. Their memory space and computing time requirements are evaluated. The effect of these requirements on the overall

system performance is investigated. The investigation shows that link invariant line programs are preferable to copied line programs in most cases. Author (ESA)

N80-23048# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DIGITAL COMPENSATORS FOR SAMPLED DATA SYSTEMS AND MINIMUM TIME COMMAND
Alain Bernard 1979 27 p refs In FRENCH; ENGLISH summary
Report will be also announced as translation (ESA-TT-607)
(ONERA-NT-1979-3) Avail: NTIS HC A03/MF A01

The minimum time command for a sampled system is that which allows a given change of state within a minimum number of sampling periods. The calculation of successive commands from the transition equations is presented and a method for determining and initializing numerical correctors is proposed. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N80-23049 Michigan Univ., Ann Arbor.
THE M/G/1 QUEUE WITH DELAYED FEEDBACK Ph.D. Thesis
Robert Doyle Foley 1979 74 p
Avail: Univ. Microfilms Order No. 8007738

The M/G/1 queue with delayed feedback is a two node queueing network. External arrivals to node one from a Poisson process. Node one has a general server with an unlimited queue capacity and a first come, first serve queue discipline. After completing service a customer either departs from the network or feeds back to node two. Node two delays customers before allowing them to reenter node one. The delay is modelled as a /M/1 queue. After completing service at node two a customer reenters node one. Thus the total input process to node one consists of exogenous arrivals and endogenous reentries from node two. The probability of a customer feeding back is allowed to depend on the queue length at nodes one and two and on the service time of the customer at node one. Dissert. Abstr.

N80-23050# Stanford Univ., Calif. Dept. of Engineering-Economic Systems.
DYNAMIC SYSTEMS Interim Report
David G. Luenberger Dec. 1979 6 p
(Grant AF-AFOSR-3141-77; AF Proj. 2304)
(AD-A080206; AFOSR-80-0051TR) Avail: NTIS
HC A02/MF A01 CSCL 12/2

During the past year of this grant, substantial progress was made in two major areas of research. The first, which was the original focus of the grant in earlier years, is that of positive dynamic systems. This work has reached the point where it is useful for certain design problems. The second area of research, which has been a new focus for the past two years, is that of descriptor variable systems. Our efforts continue on the basic theory and application for the nonlinear case. GRA

N80-23051# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A UNIFIED THEORY OF FLOW CONTROL AND ROUTING IN DATA COMMUNICATION NETWORKS Ph.D. Thesis
Seyyed Jamaaloddin Golestaani Jan. 1980 100 p refs
(Contract N00014-75-C-1183; ARPA Order 3045; Grant NSF ENG-77-19971)
(AD-A080358; LIDS-TH-963) Avail: NTIS HC A05/MF A01 CSCL 17/2

A joint flow control and routing (JFCR) strategy is proposed for store and forward communication networks. The strategy is based on a convex optimization problem in terms of the average input rates and multi-commodity flows and is shown to have the following properties: first the average load of each buffer stays below some arbitrarily chosen level for the input rate and routing assignments of the strategy. This level can be chosen so as to upper bound the probability of buffer overflow arbitrarily. Secondly, by proper selection of the cost function, it is possible to utilize the network fully and to achieve a variety of different types of priorities in the services offered to the users. Finally, the routing assignments of the strategy correspond to a routing strategy/which tends to minimize the total delay when the network is lightly loaded and tends to prevent congestion when it is heavily loaded. Furthermore, the proposed JFCR problem is shown to be equivalent to a minimum delay routing problem corresponding to a bigger network. Accordingly, any minimum delay routing algorithm can be converted into a JFCR algorithm. Using this approach, a class of JFCR algorithms with distributed computations at the nodes are developed. Under certain conditions, a one to one correspondence is shown to exist in a store and forward network between the set of average input rates and the set of average number of outstanding packets of commodities. This unique correspondence is used to show that in practice the average input rates can be adjusted as desired by restricting the number of outstanding packets on each commodity (window strategy. GRA

N80-23052# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
GRAPHICAL INPUT METHODOLOGY FOR COMPUTER AIDED ANALYSIS OF CONTROL SYSTEMS M.S. Thesis
Donald E. Troxel Dec. 1979 169 p refs
(AD-A080362; AFIT/GE/MA/79D-1) Avail: NTIS
HC A08/MF A01 CSCL 09/2

This report describes the design of a graphical input language and CAD system for specifying control system block diagrams. The goal to develop a graphical means of defining block diagrams that avoided the need to create the textual descriptions required by most existing traditional analysis packages was accomplished. Generalized requirements for a successful human interface were developed. A graphical input methodology was developed that meets these human constraints. The CAD system designed allows graphical definition of linear systems and translation of these systems into forms acceptable by traditional analysis programs. GRA

N80-23053# Brown Univ., Providence, R.I. Center for Dynamical Systems.
PRACTICAL METHODS FOR THE COMPENSATION AND CONTROL OF MULTIVARIABLE SYSTEMS Interim Report
William A. Wolovich and Peter L. Falb 1979 14 p refs
(Contract AF-AFOSR-3182-77; AF Proj. 2304)
(AD-A080265; AFOSR-80-0038TR) Avail: NTIS
HC A02/MF A01 CSCL 12/1

A new method for obtaining simple, low order models for higher order stable systems was developed and tested on a sixteenth order model of the F-100 jet engine. A scalar adaptive control procedure was extended to the multivariable case. A polynomial matrix characterization of the maximal (A,B)-invariant and controllability subspace in the kernel of C was determined together with an algorithm for the state feedback controllers which yield such maximal subspaces. This work should have significant impact in the study of systems with imprecisely known parameters. A complete resolution to the problems of determining state feedback invariants and canonical forms for linear systems characterized by proper rational transfer matrices was obtained. A number of results have been obtained illustrating the richness of the linkage between system theory and algebraic-geometry. For example, it has been shown that any symmetric transfer matrix over reals has a symmetric realization (answering an old question in network theory). Finally, a new, general purpose compensator for multivariable systems has been developed. This compensator insures simultaneous regulation, tracking, decoupling, stability, and robustness for a large class of linear multivariable systems. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-23054 Illinois Univ. at Urbana-Champaign.
THE MARTINGALE PROBLEM FOR THE DYNAMIC GAS

MODEL Ph.D. Thesis
Robert Wayne Bonvallet 1979 88 p
Avail: Univ. Microfilms Order No. 8008983

In the dynamic gas model, particles move to different sites on a lattice and no more than one particle can be at any site in the lattice at any one time. The probability of a particle at site k jumping to an unoccupied site 1 in time t is c sub k (x)P(k,1)delta t + sigma (delta t) when c sub k (x) is a nonnegative function of site k and configuration x, which tells the location of all particles, and P(k,1) is an irreducible transition kernel. Liggett has shown that under certain conditions on the functions c sub k (x) and P(k,1) there exists a unique semigroup T sub t which describes the motion of the system. It is shown here that under the same conditions, there exists a unique solution to the Martingale problem, which means that for each configuration x there exists a unique probability measure on the path space.
Dissert. Abstr.

N80-23056 Duke Univ., Durham, N. C.
A MONOTONE METHOD FOR A SYSTEM OF NONLINEAR PARABOLIC DIFFERENTIAL EQUATIONS Ph.D. Thesis
Paul Dennis Norman 1979 38 p
Avail: Univ. Microfilms Order No. 8008190

A monotone method for a system of semi-linear parabolic partial differential equations is presented. The principal tool used for obtaining this method is the maximum principle or a related comparison technique. Starting with properly defined upper and lower solutions of the system, sequences of upper and lower solutions are inductively defined and are shown to converge monotonically to the solution of the system. This is a generalization of a monotone method for a single equation of parabolic type. In the past, it has often been necessary to make the restriction of quasi-monotonicity on the non-linearities when applying the maximum principle to systems. It is shown that this restriction is not necessary here. A mathematical model describing a simple combustion process in which the nonlinearities do not satisfy the quasi-monotonicity property is discussed and the techniques developed are illustrated through this specific example.
Dissert. Abstr.

N80-23058 California Univ., Los Angeles.
THE HAMILTONIAN OF THE QUANTIZED NON-LINEAR SCHROEDINGER EQUATION Ph.D. Thesis
Stephen Charles Oxford 1979 208 p
Avail: Univ. Microfilms Order No. 8008510

As a classical equation, the nonlinear Schrodinger equation was studied successfully by means of inverse scattering. A complete family of conserved quantities was exhibited using this technique; however, in the absence of a quantum inverse scattering transform, the quantized field equations must be handled differently. The Lagrangian formalism permits the construction of a Hamiltonian associated to the NLSE, which has been explicitly spectrally decomposed by Gaudin in the repulsive case $c > 0$. Both the attractive, $c < 0$, and repulsive cases have been studied when the field is restricted to a finite interval with periodic boundary conditions, and some properties of the thermodynamic limit have been exhibited. The attractive case is treated in the quantized system strictly in the thermodynamic limit, explicitly exhibiting all bound states in the course of finding an explicit unitary transformation of the physical Hilbert space to a certain momentum space, which reduces the Hamiltonian to a multiplication operator.
Dissert. Abstr.

N80-23057 Alabama Univ., University.
ALMOST CONTINUOUS FUNCTIONS Ph.D. Thesis
Donald Lee Alexander 1979 42 p
Avail: Univ. Microfilms Order No. 8007584

The topological (or correctedness) properties of certain types of discontinuous functions are described. Particular emphasis is placed on Darboux.
Dissert. Abstr.

N80-23058 Yeshiva Univ., New York, N. Y.
THE FOURIER ANALYSIS THEORY OF UNSOLVABILITY IN PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis
Ronald Stuart Levin 1979 111 p
Avail: Univ. Microfilms Order No. 8007268

A Fourier analysis technique for proving unsolvability in partial differential equations is presented. An operator D is onto if it possesses solutions for every function in a given space. If, for some function, no solution exists, D is not onto. The Fourier transform of the adjoint of D is an operator on a Fourier transform space of entire functions. By a well known theorem, D is onto if and only if the inverse of the Fourier transform of the adjoint of D is continuous. The Fourier analysis proof of the unsolvability of Lewy's equation is developed, followed by the use of the technique to show unsolvability for a more general class of operators. One result is the unsolvability of a simple two variable equation, the proof of which is almost identical to proof of Lewy's theorem. Finally, Lewy's proof is viewed in terms of topological vector space and the Fourier analysis proof is constructed from it.
Dissert. Abstr.

N80-23059 University of Western Michigan, Kalamazoo.
UNIFORM FACTORIZATIONS OF GRAPHS Ph.D. Thesis
David Peter Burns 1979 132 p
Avail: Univ. Microfilms Order No. 8007684

Problems involving the factorization of a given graph with each factor possessing a given graph theoretical property are investigated. The first such common property to be considered is line-symmetry, and a study of line-symmetric graphs themselves is made. A three part categorization of line-symmetric graphs containing no isolated vertices is provided as are characterizations of line-symmetric graphs in terms of the addition or deletion of edges. The vertex analogs of these results are considered, and point-symmetric graphs are characterized in terms of vertex deletion. It is shown that with some restrictions, a graph is line-symmetric if and only if its line graph is point-symmetric. Several structural characterizations of line-symmetric graphs that fall into particular categories are then presented, where the categories are specified by various connectivity properties of either the graphs themselves or their complements. It is shown that line-symmetric graphs containing no isolated vertices are either regular or biregular, this latter term describing graphs whose degree set has cardinality two. Characterizations of biregular line-symmetric graphs are established and examples are provided to show that these results are best possible.
Dissert. Abstr.

N80-23060*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MULTI-LEVEL ADAPTIVE FINITE ELEMENT METHODS. 1: VARIATION PROBLEMS
Achi Brandt 2 Mar. 1979 74 p refs
(Contract NAS1-14101)
(NASA-TM-80985; ICASE-79-8) Avail: NTIS HC A04/MF A01 CSCL 12A

A general numerical strategy for solving partial differential equations and other functional problems by cycling between coarser and finer levels of discretization is described. Optimal discretization schemes are provided together with very fast general solvers. It is described in terms of finite element discretizations of general nonlinear minimization problems. The basic processes (relaxation sweeps, fine-grid-to-coarse-grid transfers of residuals, coarse-to-fine interpolations of corrections) are directly and naturally determined by the objective functional and the sequence of approximation spaces. The natural processes, however, are not always optimal. Concrete examples are given and some new techniques are reviewed. Including the local truncation extrapolation and a multilevel procedure for inexpensively solving chains of many boundary value problems, such as those arising in the solution of time-dependent problems.
M.G.

N80-23061# Texas Univ. at Austin. Center for Cybernetic Studies.
A DUAL METHOD FOR DISCRETE CHEBYCHEV CURVE FITTING WITH LINEAR RESTRICTIONS ON THE PARAMETERS
Ronald D. Armstrong and Michael G. Sklar (St. Edward's Univ., Austin, Tex.) Sep. 1979 49 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A078623; CCS-352) Avail: NTIS HC A03/MF A01 CSCL 12/1

The L at infinity norm has been widely studied as a criterion for curve fitting problems. This paper presents an algorithm to solve discrete approximation problems in the L at infinity norm when the parameters are restricted by linear constraints. The

algorithm is a special-purpose linear programming dual method which employs a reduced bases and multiple pivots. Results of the computational experience with a computer code version of the algorithm are presented. GRA

N80-23062# Wisconsin Univ. - Madison. Mathematics Research Center.
AN ADAPTIVE NONLINEAR LEAST-SQUARES ALGORITHM Summary Report
John E. Dennis (Rice Univ., Houston, Tex.), David M. Gay (MIT, Cambridge), and Roy E. Welsch (MIT, Cambridge) Oct. 1979 46 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-76-00324; Grants NSF DCR-75-10143; NSF MCS-78-09525)
(AD-A079716; MRC-TSR-2010) Avail: NTIS HC A03/MF A01 CSCL 09/2

NL2SOL is a modular program for solving nonlinear least-squares problems that incorporates a number of novel features. It maintains a secant approximation S to the second-order part of the least-squares Hessian and adaptively decides when to use this approximation. S is 'sized' before updating, something which is similar to Oren-Luenberger scaling. The step choice algorithm is based on minimizing a local quadratic model of the sum of squares function constrained to an elliptical trust region centered at the current approximate minimizer. This is accomplished using ideas discussed by More, together with a special module for assessing the quality of the step thus computed. These and other ideas behind NL2SOL are discussed and its evolution and current implementation are also described briefly. GRA

N80-23063# Wisconsin Univ. - Madison. Dept. of Statistics.
TRANSFORMATION OF GROUPED OR CENSORED DATA TO NEAR NORMALITY
Victor M. Guerrero and Richard A. Johnson Nov. 1979 11 p refs Sponsored in cooperation with ARO
(Contract N00014-78-C-0722)
(AD-A080601; UWIS-DS-79-542; ARO-15660.27M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Box and Cox (1964) an analysis of transformations proposed a power transformation which has proven utility for tranforming ungrouped data to near normality. In this paper, we extend its applicability to two frequently encountered situations: (1) grouped data and (2) Type I censored data. The asymptotic properties of the estimators are derived and illustrative examples are presented. GRA

N80-23064# Rice Univ., Houston, Tex. Aero-Astronautics Group.
NEW TECHNIQUES IN NUMERICAL ANALYSIS AND THEIR APPLICATION TO AEROSPACE SYSTEMS Final Report, 1 1 Sep. 1976 - 31 Dec. 1979
Angelo Miele 1979 72 p
(Grant AF-AFOSR-3075-76; AF Proj. 2304)
(AD-A080445; AAR-146; AFOSR-80-0050TR) Avail: NTIS HC A04/MF A01 CSCL 22/3

This document summarizes the research performed at Rice University during the period 1976-79 under AFOSR 76-3075 in several areas of numerical analysis of interest in aerospace systems theory, namely solution of nonlinear equations, solution of differential equations, mathematical programming problems, and optimal control problems. The work summarized here is applicable to these areas of aerospace engineering optimum atmospheric flight trajectories, optimum extra-atmospheric flight trajectories, optimum aerodynamic shapes, and optimum structures. GRA

N80-23065# California Univ., Los Angeles. Dept. of System Science.
A COMPARISON OF THE OPTICAL ORDERING LEVELS OF BAYESIAN AND NON-BAYESIAN INVENTORY MODEL
Katy S. Azoury and Bruce L. Miller (Ill. Univ. at Chicago Circle) Dec. 1979 29 p refs
(Contract N00014-78-C-0428)
(AD-A080599) Avail: NTIS HC A03/MF A01 CSCL 15/5

Although it is often the case that the parameters of the distribution of demand are not known with certainty and that a Bayesian formulation would be appropriate, such an approach is generally not used in inventory calculations for computational reasons. Since one often resorts to a non-Bayesian formulation, it is of interest to compare Bayesian policies with a comparable non-Bayesian policy. It was anticipated that the non-Bayesian policy (quantity ordered) would be an upper bound to the Bayesian policy. This result is established for a two-period standard inventory model and for the n-period non-depletive inventory model. However, a counterexample is given in the standard inventory model for an alternative comparable non-Bayesian formulation. GRA

N80-23066# Army Research Office, Research Triangle Park, N. C.
TRANSACTIONS OF THE 25TH CONFERENCE OF ARMY MATHEMATICIANS
Jan. 1980 801 p refs Conf. held in Baltimore, 6-8 Jun. 1979; sponsored by the Army Mathematics Steering Comm.
(AD-A080736; ARO-80-1) Avail: NTIS HC A99/MF A01 CSCL 20/4

The Silver Anniversary of the Conferences of Army Mathematicians was conducted on the dates 6-8 June 1979. The U.S. Army Ballistic Research Laboratory and the Johns Hopkins University served as its hosts. It was held on the Homewood Campus of the Johns Hopkins University in Baltimore, Maryland. 'Continuum Mechanics' was the theme selected for the Silver Jubilee. To celebrate this occasion the number of guest speakers were increased, and those individuals who were invited to talk were selected because they are effective researchers who are in the frontiers of their fields. Another important reason for their appearance on the program is that they are interested in current and envisioned U.S. Army materiel research and development problems. As in previous conferences there were a large number of papers contributed by Army scientists. These, on the whole, addressed problems of immediate interest to scientists in the various Army laboratories. GRA

N80-23067# Applied Decision Analysis, Inc., Menlo Park, Calif.
ALGEBRAIC MODELING SYSTEM
Allen C. Miller Jul. 1979 15 p Prepared for Lawrence Livermore Lab., Calif.
(Contract W-7405-eng-48)
(UCRL-15074) Avail: NTIS HC A02/MF A01

The design of an algebraic modeling system is summarized. The purpose and capabilities of the algebraic modeling system are discussed and the set of commands used to instruct the system to construct and analyze models is specified. DOE

N80-23068# Argonne National Lab., Ill.
SOME RECENT MATHEMATICAL DEVELOPMENTS IN BOUNDING AND APPROXIMATING TRANSIENT CREEP SOLUTIONS
Richard A. Valentin 1979 8 p refs Presented at the 2nd Intern. Seminar on Inelastic Analysis and Life Prediction in High Temperature Environ., Berlin, 20-21 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790874-1) Avail: NTIS HC A02/MF A01

Current practice in the elevated temperature design of reactor components and structures places major emphasis on the development of constitutive laws, their application in detailed finite element analyses, and comparison of the resulting field quantities with limits specified by various design codes. While this design philosophy is of proven practical value, its success has resulted in reduced emphasis on the development of general mathematical results applicable to wide classes of creep problems. This lecture argues for a reexamination of the emphasis being placed on detailed analysis of specific geometries as opposed to the use of approximate analysis and bounding calculations. The main objective is to introduce the designer to certain classes of a priority estimates of creep response and to explore their potential in justifying the broad generalization often required to apply code rules in specific cases. DOE

N80-23069# California Univ., Livermore. Lawrence Livermore Lab.
SOLUTION OF THE TIME-DEPENDENT INCOMPRESSIBLE NAVIER-STOKES AND BOUSSINESQ EQUATIONS USING THE GALERKIN FINITE ELEMENT METHOD
Philip M. Gresho, Robert L. Lee, Stevens T. Chan, and Robert

L. Sani Aug. 1979 21 p refs Presented at the IUTAM Symp. on Approximation Methods for Navier-Stokes Probl., Paderborn, West Germany, 9-15 Sep. 1979
(Contract W-7405-eng-48)
(UCRL-82899; CONF-790939-1) Avail: NTIS HC A02/MF A01

The generation of a time dependent, three-dimensional model of the atmospheric boundary layer using the Galerkin finite element method (GFEM) is described. Capabilities were developed for solving the two dimensional Navier-Stokes and Boussinesq equations, both steady and time-dependent. The GFEM is applied to the primitive variable (u,P,T) equations, thus generating, in the conventional manner, a coupled system of ordinary differential equations in time. A time integration method which gives very accurate, and reasonably efficient solutions to these time-dependent problems is discussed. It is stable for any grid spacing and Reynolds number, is nondissipative, and incorporates an automatic time stem selection strategy. The techniques are then demonstrated by means of two numerical examples - both starting with a motionless system: (1) a thermally driven square cavity which goes to a steady-state and (2) isothermal flow around a circular cylinder which leads to periodic vortex shedding. DOE

N80-23070# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL SOLUTION OF NONLINEAR PROBLEMS
Homer T. Walker (Univ. of Houston, Texas) Sep. 1979 228 p
(Contract W-7405-eng-48)
(UCID-18285) Avail: NTIS HC A11/MF A01

A reproduction of the visuals that were used in the videotaped LLL Continuing Education Course CE1715 Numerical Solution of Nonlinear Problems is presented. The course surveyed aspects of the derivation, implementation, and application of algorithms for the iterative solution of multivariable nonlinear equations and unconstrained optimization problems. Topics included nonlinear problems in one variable Newton's method for systems of nonlinear equations, globally convergent modifications of Newton's method, and secant-update methods. DOE

N80-23071# Sandia Labs., Albuquerque, N. Mex. Ground Motion and Seismic Div.
NONRECURSIVE WEINER FILTER DESIGN
Samuel D. Stearns Sep. 1979 46 p refs
(Contract EY-76-C-04-0789)
(SAND-79-1319) Avail: NTIS HC A03/MF A01

This is a tutorial report on the design of nonrecursive filters using the least-mean-squared (LMS) error criterion. A version of Levinson's algorithm for solving the LMS equations is described. The emphasis is on applying LMS-design theory to cases such as system identifications, noise cancellation, prediction, inverse filtering, and deconvolution. Examples are included. DOE

N80-23072# Brookhaven National Lab., Upton, N. Y. Applied Mathematics Dept.
REDUCTION OF A DISCRETE EVENT SIMULATION TO A MARKOV CHAIN
A. S. Noetzel and E. J. Weyuker 1979 7 p refs Presented at the Winter Simulation Conf., San Diego, Calif., 3 Dec. 1979 Prepared in cooperation with New York Univ., and Sperry Univac, St. Paul, Minn.,
(Contract EY-76-C-02-0016)
(BNL-26707; CONF-791207-2) Avail: NTIS HC A02/MF A01

An event driven, time based, stochastic simulation model was modified in a straight forward manner to satisfy the axioms of a discrete state, continuous time Markov chain. The method required casting the probability distribution of each random variable representing a time interval of the process into the form of a series of exponentially distributed stages. An algorithm for this transformation was developed. The technique demonstrated by means of a simple example of a computer system simulation. The Markov chain representation of the simulation can be solved numerically; this solution provides an independent verification of the logic of the simulation. DOE

N80-23073# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THEORY AND NUMERICAL METHODS OF RESOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS
Pierre Laval 1979 174 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-606)
(ONERA-NT-1979-2) Avail: NTIS HC A08/MF A01

The general properties of second order partial differential equations and of systems of higher order are discussed. The various classical boundary problems, whether hyperbolic, parabolic or elliptic, are presented in the simple case of the wave, heat, and Laplace equations with two independent variables. The numerical methods available to solve these equations are examined. The finite element method is presented within the framework of two dimensional elliptic or three dimensional parabolic problems. The finite difference methods of pseudo viscosity are presented and studied for problems of unsteady compressible flows with shock waves. Author (ESA)

N80-23074# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
A HIERARCHIAL CLUSTERING SCHEME FOR ASYMMETRIC MATRICES
D. S. Bree (Technische Hogeschool, Delft), B. J. Lageweg, J. K. Lenstra, A. H. G. Rinnooy (Erasmus Univ.), and G. vanBezouwen (Technische Hogeschool, Delft) May 1978 29 p refs Submitted for publication
(MC-BW-88/78) Avail: NTIS HC A03/MF A01; Stichting Math. Centrum, Amsterdam FL 3

The problem of grouping elements, given asymmetric relationships between them, is studied. Two criteria for distinguishing between arrangements are developed: the distortion, based on the eigenvalues of the interaction matrix, and the composition, based on the amount of information lost by combining groups. The goal is to locate those arrangements in the space of the two criteria that lie close to the Pareto-optimal points. A heuristic search procedure is proposed, which allocates each element to a separate group and then combines groups is reached. The method is applied to illustrative examples and compared to other approaches. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-23075 Illinois Univ. at Urbana-Champaign.
A NON-STANDARD APPROACH TO BROWNIAN LOCAL TIME Ph.D. Thesis
Edwin Arend Perkins 1979 205 p
Avail: Univ. Microfilms Order No. 8009129

Nonstandard analysis may be used to represent a standard stochastic process by means of a discrete and more intuitive internal stochastic process. Such a representation often leads to new insights into the original standard process. A representation of this type is given for the local time of a Brownian motion. This new formulation of local time allows us to show that Levy's characterization of local time as the mesure du voisinage of the Brownian path holds uniformly in x and not just for a single value of x. A similar result is obtained for the characterization of the local time as a limit of the number of upcrossings of the Brownian motion. In addition, a nonstandard description of weak convergence is used to establish some weak invariance principles for local time in which local time is realized as the weak limit of the normalized sums of the overshoots of a random walk. Dissert. Abstr.

N80-23076 Illinois Univ. at Urbana-Champaign.
ROBUSTNESS IN BAYESIAN INFERENCE Ph.D. Thesis
Thomas Grant Menten 1979 99 p
Avail: Univ. Microfilms Order No. 8009105

It is postulated that one reason for the scarcity of robustness studies is a lack of agreement on what should characterize a robustness study. This lack of agreement results in part from the fact that the subjective interpretation of probability used in Bayesian inference differs from the relative frequency interpretation used in sampling theory. Thus Bayesians have tended to avoid studies directed at procedures in favor of studies restricted to a particular data analysis. The characteristics of these two

approaches are examined in detail. Neither the approach of Bayesian inference nor the use of subjective probabilities requires the avoidance of procedure directed studies. It is argued that procedure directed studies are both possible and desirable within the framework of Bayesian inference. Specific strategies are suggested for studying the robustness of Bayesian procedures, and these methods are developed in exemplary robustness investigations. Author

N80-23077 Michigan Univ., Ann Arbor.
STATISTICAL ANALYSIS OF SHAPE WITH CONIC SECTIONS AND ELLIPTICAL DISTRIBUTIONS ON A HYPERSPHERE Ph.D. Thesis
Paul David Sampson 1979 156 p
Avail: Univ. Microfilms Order No. 8007824

The failings of previous statistical approaches to shape are resolved in three ways. First, arcs of conic sections are used to model the outlines of shapes idealized as convex, twice-differentiable curves. Second, elliptical distributions on a four dimensional unit hypersphere are used to model populations of shapes represented by arcs of conic sections. Then, geometric envelopes of arcs of equal probability density are defined to examine, in the Euclidean plane, the variation in shape. The theory and methods are applied to the study of the shape of the human dental arch form. Conic arcs are fit to data describing the shapes of a sample of 66 dental arches, and the Bingham distribution is used to model the fitted conic arcs. Envelopes demonstrate the precision of the estimation of the modal shape and the range of variation in dental arch shapes. Dissert. Abstr.

N80-23078 Princeton Univ., N. J.
STATISTICAL MODELS Q-PERMUTATIONS Ph.D. Thesis
Arthur Richard Silverberg 1979 159 p
Avail: Univ. Microfilms Order No. 8008568

A person's preferences for m objects are often expressed as a ranking or permutation of all these an objects. Sometimes just some, say the top q objects are listed -- this will be called a q-permutation. If people are indifferent to the objects, all permutations have the same probability. This leads to the uniform distribution on permutations. However, people usually have preferences, and they may differ from group to group. Hence, two new statistical models for q-permutations were developed. The first model is defined by successive sampling from q vases that may have different proportions of balls labeled 1,...,m. A vase is an urn where the number of balls maybe infinite. The second is the Log-Linear model. It may be obtained by modifying the sampling scheme on these vases. The sufficient statistics of the Log-Linear models are the numbers of rankers who rank the ith object jth. Dissert. Abstr.

N80-23079 Maryland Univ., College Park.
THE EFFECT OF PARAMETER CHANGES ON ESTIMATES USING RANDOMIZED RESPONSE Ph.D. Thesis
Karen Lynne Gienapp Soeken 1979 108 p
Avail: Univ. Microfilms Order No. 8008244

The main and joint effects of two parameters in the randomized response design are discussed: the probability of selecting the sensitive question in a randomized response design and the proportion of individuals possessing the nonsensitive characteristic. The effects upon three variables are assessed: (1) the estimated proportion of individual possessing the sensitive characteristic, (2) the protection perceived by the subject, and (3) the willingness to use randomized response. A 2 x 4 factorial design was employed with two strategies for selection of the nonsensitive question and four levels of random selection of the sensitive question. Results indicate that probability level does interact significantly with response for low and moderately sensitive items. Probability level is significant in respondent perception of protection. However, neither variable shows significant effect on respondent attitude toward responding to survey questions under randomized response. Dissert. Abstr.

N80-23080 Connecticut Univ., Storrs.
A GENERAL CLASS OF ONE-SAMPLE NONPARAMETRIC TEST STATISTICS BASED ON SUBSAMPLES Ph.D. Thesis
William Robert Stephenson 1979 110 p
Avail: Univ. Microfilms Order No. 8008691

A general class of one-sample non-parametric test statistics based on the sign of the most extreme value in subsamples of size m are proposed. General formulas for the mean and variance are given. By means of a Monte Carlo study, the small sample power was compared to that of the sign test, Wilcoxon signed-rank test, and the t-test statistics. The power of the proposed test statistics compared favorably in magnitude to the power of competing test statistics. Dissert. Abstr.

N80-23081 Rochester Univ., N. Y.
P-VALUES: ASYMPTOTICS AND ROBUSTNESS Ph.D. Thesis
Diane Marie Lambert 1978 224 p
Avail: Univ. Microfilms Order No. 7815288

Various properties of P-values that are useful for the comparison of test procedures at, or close to, a specified alternative distribution are determined. Asymptotic lognormality, influence curves, and continuity or qualitative robustness of P-values are investigated. The literature on P-values is reviewed from their somewhat vague thirteenth century origins to current perspectives on their use. Various previously proposed measures of their behavior, such as the exponential rate, termed the half-slope, at which they approach zero under the alternative hypothesis are described. Dissert. Abstr.

N80-23082# American Univ., Washington, D. C.
A STUDY OF THE SINGLY TRUNCATED NORMAL DISTRIBUTION Final Report, 1 Sep. 1977 - 31 Jul. 1979
David S. Crosby 31 Jul. 1979 42 p refs
(Contract N00014-77-C-0624)
(AD-A080198) Avail: NTIS HC A03/MF A01 CSCL 08/10

Procedures which use standard and new statistical techniques to estimate radiances for a high spacial resolution, multiple field-of-view instrument are developed. The theory of the truncated normal distribution is applied to obtain the estimate of the radiance. A sequential procedure for determining an optimal truncation point for the single parameter truncated normal is developed. Examples of the application of these techniques to real data are provided. GRA

N80-23083# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.
A STOCHASTIC REPRESENTATION FOR THE PRINCIPAL EIGENVALUE OF A SECOND-ORDER DIFFERENTIAL EQUATION Interim Report
Ioannis Karatzas Nov. 1979 25 p refs
(Grant AF-AFOSR-3063-76; AF Proj. 2304)
(AD-A080212; AFOSR-80-0048TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Using ideas from stochastic control a stochastic representation for the smallest eigenvalue of a second-order differential equation has been devised. As a side-result an associated stationary control problem in a very general setting has been solved. GRA

N80-23084# Princeton Univ., N. J. Plasma Physics Lab.
SELF-CONSISTENT KINETIC THEORY OF STOCHASTICITY
John Krommes, A. Aug. 1979 15 p refs Presented at the Intern. Workshop on Intrinsic Stochasticity in Plasmas, Corsica, 18-23 Jun. 1979
(Contract EY-76-C-02-3073)
(PPPL-AF-89; CONF-7906106-2) Avail: NTIS HC A02/MF A01

It is argued that renormalized kinetic theory is the appropriate tool with which to study macroscopic properties of stochastic systems. Functional technique are described which afford a self-consistent describing of nonlinear excitation, propagation, and dielectric response of fluctuations in the stochastic regime. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-23085 New Mexico Univ., Albuquerque.
STOCHASTIC STABILITY OF INTERCONNECTED SYSTEMS

Ph.D. Thesis
Dhemetrios Boussalis 1980 175 p
Avail: Univ. Microfilms Order No. 8008073

The operation of the interconnected system in a noisy environment introduces additional difficulty to the stability studies of such dynamical systems. Specifically, the mathematical models describing the subsystems as well as the interconnecting structure become dependent on random parameters or random functions, thus making the techniques used to manipulate systems described by ordinary differential equations inapplicable. This dissertation considers several classes of interconnected systems described by Ito stochastic differential equations and consisting of multiterminal, nonlinear, time-varying components. Stochastic Lyapunov functions are constructed, in scalar and vector form for the interconnected system in terms of the Lyapunov functions associated with the individual components, the system structure, and a parameter vector determined in some prescribed optimal manner. Dissert. Abstr.

N80-23086 New Mexico State Univ., University Park.
STABILITY OF LARGE-SCALE SYSTEMS Ph.D. Thesis
Helen Alexandra Ryaciotaki-Boussalis 1980 159 p
Avail: Univ. Microfilms Order No. 8007674

The stability of classes of large scale systems, consisting of multiterminal, nonlinear, time varying components is examined. Both continuous and discrete time systems are considered. The stability analysis of the interconnected system is determined in terms of the properties of the individual components and their interconnection patterns. Scalar and vector Lyapunov functions are constructed for the composite systems in terms of Lyapunov functions of the subsystems, the system structure, and a parameter vector. The stability criteria derived guarantee the stability of the interconnected system and are given in forms which are well suited for digital computation and design. Several examples are given for illustration. Dissert. Abstr.

N80-23087# Desmatics, Inc., State College, Pa.
OPTIMAL DESIGNS FOR ESTIMATION OF THE TWO-PARAMETER LOGISTIC FUNCTION
Leslie A. Kalish and Dennis E. Smith Jan. 1980 26 p refs
(Contracts N00014-79-C-0128; N00014-75-C-1054; NR Proj. 207-037; NR Proj. 042-334)
(AD-A080572; TR-112-4) Avail: NTIS HC A03/MF A01 CSCL 12/2

In this report, optimal designs for weighted least squares and maximum likelihood estimation of the two parameter logistic function are constructed. In particular, four criteria for optimality are considered: D, A, E and G-optimality. The D and G optimality criteria are found to be invariant to changes in scale while the A and E optimality criteria are not. Practical problems which arise in the implementation of the optimal designs are discussed. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-23088 Illinois Univ. at Urbana-Champaign.
RECURSIVE FUNCTION THEORY IN GROUPS AND SEMIGROUPS Ph.D. Thesis
Vardeman Griffith Moore 1979 120 p
Avail: Univ. Microfilms Order No. 8009113

The connections between notions of recursive function theory and the theory of groups and semigroups are considered. It is shown that a finitely generated, recursively presented semigroup can be embedded in a finitely presented semigroup whose word problem has the same Turing degree of unsolvability as that of the original semigroup. This result is proved using a construction involving Turing machines. Other results give algebraic characterizations of recursively enumerable sets, recursive sets, and partial recursive functions. For example, a set S of elements of a finitely generated, recursively presented group G is recursively enumerable if and only if G can be embedded in a finitely presented group H and S is the solution set of an equation f(x) = 1 in H. It is also shown that a group G has solvable word problem if and only if an analog of the enumeration theorem of recursive function theory holds for G. Most of these results are proved both for groups and semigroups. Algebraic techniques are used for the proofs of the results for groups, while both algebraic techniques and techniques based on Turing machines are used to prove the results for semigroups. Dissert. Abstr.

N80-23089 California Univ., Berkeley.
PRODUCT AND COMMUTATION PROPERTIES OF HILBERT SPACE OPERATORS Ph.D. Thesis
Michael John Hoffman 1979 202 p
Avail: Univ. Microfilms Order No. 8008429

This research concerns the set D(K,J) of operators commuting modulo a two-sided *-ideal J with each element of a subset K of the algebra L(H) of all bounded linear operators on a Hilbert space H. The set D(K,J) is an algebra, a *-algebra if K is closed under taking adjoints, and a C*-algebra if J is closed. Let M(K,J) = { epsilon L(h): TS epsilon J for every S epsilon K. If K and J are both two sided ideals, then M(K,J) is also an ideal studied by several authors, for example Norberto Salinas, who calls it a relative conjugate ideal. Ideals of operators on possibly nonseparable Hilbert spaces are classified by the dimensions of the ranges of operators in them and are determined by the diagonal operators they contain. These ideas are used to show that D(K,J) consists of perturbations of scalar multiples of the identity by elements. Dissert. Abstr.

N80-23090# Florida State Univ., Tallahassee. Dept. of Statistics.
A MINIMAX AND ADMISSIBLE SUBSET SELECTION RULE FOR THE LEAST PROBABLE MULTINOMIAL CELL
Roger L. Berger Sep. 1979 16 p refs
(Contract DAAG29-79-C-0158)
(AD-A080582; FSU-STATISTICS-M522; ARO-16713.4-M)
Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper a new subset selection rule for selecting a subset containing the least probable multinomial cell is defined. The rule is shown to be minimax and admissible in the class of rules which have a preassigned probability of at least P^* of selecting the least probable cell provided that P^* is sufficiently large. The loss used is the number of non-best cells selected. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-23091 California Univ., Davis.
CURVATURE THEORY OF POINT TRAJECTORIES IN THREE-DIMENSIONAL KINEMATICS Ph.D. Thesis
Lih-Min Hsia 1979 155 p
Avail: Univ. Microfilms Order No. 8009502

The curvature theory of point trajectories in constrained three dimensional motion of rigid bodies is investigated via instantaneous invariants. Two independent methods were used to obtain the kinematic characteristics i.e., the instantaneous invariants of the motion. The first method, is used to establish the correspondence between the instantaneous invariants and the dual instantaneous invariants. The second method applies systematic coordinate transformations via well-known vector calculus. The instantaneous invariants were used to derive expressions for curvature and torsion of point path trajectories in analytical forms. A FORTRAN code for the complete kinematic and curvature analyses of point trajectories of the RCCC mechanism is presented to demonstrate the advantages of using dual subroutines. Dissert. Abstr.

N80-23092 California Univ., Los Angeles.
THERMAL CONVECTION AND MAGNETIC FIELD GENERATION IN ROTATING SPHERICAL SHELLS Ph.D. Thesis
Pham Giem Cuong 1979 153 p
Avail: Univ. Microfilms Order No. 8008468

The generation of planetary magnetic fields is discussed. The nonlinear magnetohydrodynamic problem of thermal convection driven dynamo is formulated and solved numerically. The analysis proceeds in three steps: (1) the problem of nonmagnetic finite amplitude convection is solved; (2) the velocity

field is used to solve the induction equation for the magnetic field with vanishing growth rate; and (3) the resulting magnetic field is used as the starting point of an iterative approach to the solution of the full magnetohydrodynamic problem.
Dissert. Abstr.

N80-23093 Princeton Univ., N. J.
ASPECTS OF THE STATISTICAL THEORY OF STOCHASTIC MAGNETIC FIELDS: TEST PARTICLE TRANSPORT AND TURBULENT COLLISIONLESS TEARING MODE Ph.D. Thesis
Robert George Kleva 1980 202 p
Avail: Univ. Microfilms Order No. 8008564

Test particle transport in a stochastic magnetic field is examined. In the absence of collisions, the test particle self-diffusion coefficient is given by D = D sub M V (in the zero gyroradius limit), where D sub M is the magnetic diffusion coefficient due to a given spectrum of magnetic fluctuations and V is the particle velocity along a field line. The effect of collisions, either classical or turbulent, on this result is considered. The evolution of the collisionless tearing mode in the presence of a stochastic magnetic field is also considered. A statistical closure approximation, obtained from the direct interaction approximation by neglecting a mode-coupling term, is used to derive a nonlinear dispersion relation. Dissert. Abstr.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-23094 Illinois Univ. at Urbana-Champaign.
THEORY OF GUIDED ACOUSTIC WAVES IN PIEZOELECTRIC SOLIDS Ph.D. Thesis
Supriyo Datta 1979 78 p
Avail: Univ. Microfilms Order No. 8009012

A non-iterative variational technique for solving the acoustic field equations is described and applied to three different boundary conditions, namely, a free surface, an edge, and a surface with periodic discontinuities. A perturbation approach to surface wave scattering by periodic discontinuities is also developed and used to obtain both the elastic and the piezoelectric scatter matrix of a single electrode in a periodic array directly from the material parameters of the substrate and the electrodes. This scatter matrix accurately predicts the response of surface wave filters, transducers, and reflectors. Dissert. Abstr.

N80-23095 Virginia Polytechnic Inst. and State Univ., Blacksburg.
NONLINEAR INTERACTIONS OF ACOUSTIC FIELDS WITH BODIES UNDER HARMONIC EXCITATIONS Ph.D. Thesis
Samuel Graham Kelly 1979 158 p
Avail: Univ. Microfilms Order No. 8007337

The multidimensional finite amplitude waves produced in a lossless fluid by the harmonic pulsations of a body in the flow field are examined. The pulsations are assumed to be such that they are expandable in a Fourier series in time and the independent coordinates describing the surface of the body. The analysis is applicable to isentropic gases and nondissipative liquids. The equations describing the dimensionless velocity potential and the fluid pressure are derived along with the boundary conditions at the surface of the body. The first problem considered is the interaction of an acoustic field with a plate undergoing near resonant flexations. The method of renormalization is used to obtain uniformly valid expansions for the velocity components and the pressure by coordinate strainings in two dimensions. The technique is applied to the finite amplitude waves produced by the pulsations of an infinite circular cylinder, a finite circular cylinder, and a sphere. Dissert. Abstr.

N80-23096*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TIME DEPENDENT DIFFERENCE THEORY FOR SOUND PROPAGATION IN AXISYMMETRIC DUCTS WITH PLUG FLOW
K. J. Baumeister 1980 12 p refs Presented at 6th Aeroacoustics Conf., Hartford, Conn. 4-6 Jun. 1980; sponsored by AIAA
(NASA-TM-81501; E-438) Avail: NTIS HC A02/MF A01 CSCL 20A

The time dependent governing acoustic-difference equations and boundary conditions are developed and solved for sound propagation in an axisymmetric (cylindrical) hard wall duct with a plug mean flow and spinning acoustic modes. The analysis begins with a harmonic sound source radiating into a quiescent duct. This explicit iteration method then calculates stepwise in real time to obtain the transient as well as the 'steady' state solutions of the acoustic field. The time dependent finite difference analysis has two advantages over the steady state finite difference and finite element techniques: (1)the elimination of large matrix storage requirements, and (2)shorter solution times under most conditions. Author

N80-23097*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRESSURE SPECTRA AND CROSS SPECTRA AT AN AREA CONTRACTION IN A DUCTED COMBUSTION SYSTEM
J. H. Miles and D. D. Raftopoulos 1980 12 p refs Presented at 1980 ASME Aerospace Conf., San Francisco, 13-15 Aug. 1980
(NASA-TM-81477; E-411) Avail: NTIS HC A02/MF A01 CSCL 20A

Pressure spectra and cross-spectra at an area contraction in a liquid fuel, ducted, combustion noise test facility are analyzed. Measurements made over a range of air and fuel flows are discussed. Measured spectra are compared with spectra calculated using a simple analytical model. Author

N80-23098*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF INFLOW CONTROL ON INLET NOISE OF A CUT-ON FAN
Richard P. Woodward and Frederick W. Glaser 1980 13 p refs Presented at 6th Aeroacoustics Conf., Hartford, Conn., 4-6 Jun. 1980; sponsored by AIAA
(NASA-TM-81487) Avail: NTIS HC A02/MF A01 CSCL 20A

The control of turbulence and other inflow disturbances in anechoic chambers for static turbofan noise studies was studied. A cut-on, high tip speed fan stage was acoustically tested with three configurations of an inflow control device in an anechoic chamber. Although this was a cut-on design, rotor inflow interaction appeared to be a much stronger source of blade passing tone radiated from the inlet than rotor stator interaction for the 1.6 mean rotor chord separation. Aft external suction applied to the area where the inflow control device joined the inlet produced a further reduction in blade passing tone, suggesting that disturbances in the forward flow on the outside of the inlet were superimposed on the inlet boundary layer and were a significant source of tone noise. M.G.

N80-23099*# General Electric Co., Cincinnati, Ohio.
ANALYTICAL STUDY OF THE EFFECTS OF WIND TUNNEL TURBULENCE ON TURBOFAN ROTOR NOISE Final Report
P. R. Gliebe and E. J. Kerschen Dec. 1979 126 p
(Contract NAS2-10002)
(NASA-CR-152359) Avail: NTIS HC A06/MF A01 CSCL 20A

The influence of tunnel turbulence on turbofan rotor noise was carried out to evaluate the effectiveness of the NASA Ames 40 by 80 foot tunnel in simulating flight levels of fan noise. A previously developed theory for predicting rotor/turbulence interaction noise was refined and extended to include first-order effects of inlet turbulence anisotropy. This theory was then verified by carrying out extensive data/theory comparisons. The resulting model computer program was then employed to carry out a parametric study of the effects of fan size, blade number, and operating line on rotor/turbulence noise for outdoor test stand, NASA Ames wind tunnel, and flight inlet turbulence conditions. A major result of this study is that although wind tunnel rotor/turbulence noise levels are not as low as flight levels they are substantially lower than the outdoor test stand levels and do not mask other sources of fan noise. A.R.H.

N80-23100*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORWARD ACOUSTIC PERFORMANCE OF A SHOCK-SWALLOWING HIGH-TIP-SPEED FAN (QF-13)
James G. Lucas, Richard P. Woodward, and Michael J. MacKinnon May 1980 20 p refs
(NASA-TP-1668; E-202) Avail: NTIS HC A02/MF A01 CSCL 20A

Forward noise and overall aerodynamic performance data are presented for a high-tip-speed fan having rotor blade airfoils designed to alter the conventional leading-edge bow shocks to weak, oblique shocks which are swallowed within the interblade channels. It was anticipated that the swallowed shocks would minimize the generation of multiple-pure-tone noise. In the speed range where the shocks presumably were swallowed, the multiple-tone noise was lowered only about 3 decibels. Comparison with several high-speed fans on a thrust-corrected basis indicates that the present fan was the quietest in total forward noise at low speeds but offered no advantage at high speeds. Author

N80-23101*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGHER ORDER MODE PROPAGATION IN NONUNIFORM CIRCULAR DUCTS
Y. C. Cho and K. U. Ingard 1980 11 p refs Presented at the 6th Aeroacoustics Conf., Hartford, 4-6 Jun. 1980; sponsored by AIAA Prepared in cooperation with MIT, Cambridge
(NASA-TM-81481; E-418) Avail: NTIS HC A02/MF A01 CSCL 20A

Higher order mode propagation in a nonuniform circular duct without mean flow was investigated. An approximate wave equation is derived on the assumptions that the duct cross section varies slowly and that mode conversion is negligible. Exact closed form solutions are obtained for a particular class of converging-diverging circular duct which referred to as 'circular cosh duct.' Numerical results are presented in terms of the transmission loss for the various duct shapes and frequencies. The results are applicable to multimodal propagation, single mode propagation, and sound radiation from certain types of contoured inlet ducts, or of sound propagation in a converging-diverging duct of somewhat different shape from a cosh duct. F.O.S.

N80-23102*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EXPLORATORY SURVEY OF NOISE LEVELS ASSOCIATED WITH A 100kW WIND TURBINE
J. R. Balombin 1980 20 p refs Presented at the 99th Meeting of the Acoustical Soc. of Am., Atlanta, 21-25 Apr. 1980
(NASA-TM-81486; E-424) Avail: NTIS HC A02/MF A01 CSCL 20A

Noise measurements of a 125-foot diameter, 100 kW wind turbine are presented. The data include measurements as functions of distance from the turbine and directivity angle and cover a frequency range from 1 Hz to several kHz. Potential community impact is discussed in terms of A-weighted noise levels relative to background levels, and the intrasonic spectral content. Finally, the change in the sound power spectrum associated with a change in the rotor speed in described. The acoustic impact of this size wind turbine is judged to be minimal. M.G.

N80-23103# Oak Ridge Y-12 Plant, Tenn. Instrumentation and Characterization Dept.
ITERATIVE CALCULATION OF IMPULSE RESPONSES FROM ULTRASONIC SIGNALS
R. C. McClung and M. W. Moyer 6 Sep. 1979 20 p ref
(Contract W-7405-eng-48)
(Y/DW-23) Avail: NTIS HC A02/MF A01

Iterative techniques were developed to calculate the impulse response of a medium under ultrasonic interrogation. This permits the identification and separation of reflected signals with pulse widths greater than the distance between two adjacent reflecting surfaces. The results may provide significant new information with respect to the spatial distribution and geometry of material discontinuities. DOE

N80-23104# European Space Agency, Paris (France).
NOISE GENERATION BY JET-ENGINE EXHAUST DEFLECTION
Burkhard Gehlar, Werner Dobrzynski, and Bernhard Fuhrken Jul. 1979 50 p refs Transl into ENGLISH of "Schallerzung durch Triebwerksstrahl-Deflexion", Rept. DFVLR-FB-78-21, DFVLR, Brunswick, Sep. 1978 Original report in GERMAN previously announced as X79-76750
(ESA-TT-553; DFVLR-FB-78-21) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 23.30

Noise radiation by jet engine exhaust-flow-interaction with blast deflectors is investigated by means of model-experiments of scale 0.1. The investigations pertain to a specific deflector configuration. Noise spectra and directivity characteristics for various power-settings and configuration changes are determined and used for the prediction of noise generation by the full-scale configuration. The investigation shows that the particular deflector gives rise to higher noise levels than those of the corresponding engine noise alone when the distance between exhaust nozzle and deflector is less than 10 nozzle-diameters. Author (ESA)

N80-23105# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
SHEAR LAYER EFFECTS ON THE PERFORMANCE OF AN ACOUSTIC MIRROR MICROPHONE SYSTEM
Friedrich-Reinhard Grosche and Gianfranco Chiocchia (Politecnico di Torino) Mar. 1979 102 p refs
(DFVLR-FB-79-30) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 15.20

The waves travelling from a sound source within the open test section of a wind tunnel to an acoustic mirror-microphone system outside the test section were refracted and scattered by the free shear layer surrounding the wind tunnel flow. The effects of refraction on the performance of the mirror system were determined by calculating numerically the diffraction images of a point source of sound with and without flow. The computed data were then compared to the results of a corresponding set of experiments in a low speed windtunnel. Author (ESA)

N80-23106# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
ON THE SOUND FIELD GENERATED BY A FAN IN A HARD-WALLED BAFFLED DUCT WITH UNIFORM FLOW
J. N. Laan and J. B. H. M. Schulten 22 Feb. 1978 67 p refs
(Contracts NIVR-1773; NIVR-1821)
(NLR-TR-78024-U) Avail: NTIS HC A04/MF A01

A method to calculate the generation, transmission and radiation of fan noise is described. A steady uniform flow is assumed in the whole field. A hard walled circular duct is considered which is terminated at the open end by an infinite baffle. It is shown that the source mechanism is the impingement of wakes from an upstream row giving rise to fluctuating blade forces: this force field drives the sound field. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-23107 California Univ., Los Angeles.
MULTIPHOTON IONIZATION IN POLYATOMIC MOLECULES Ph.D. Thesis
David Hubert Parker 1979 174 p
Avail: Univ. Microfilms Order No. 8008512

Multiphoton ionization (MPI) processes were experimentally investigated and utilized to study highly excited states in polyatomic molecules. The systems examined all deal with three- or four-photon ionization enhanced by an allowed two-photon transition from the ground state. The MPI polarization method is described and applied to a number of spectroscopic problems such as the the location of A(g) symmetry-forbidden states, the mechanism of spatially separated molecular orbital interactions,

the energy of the pion and non-bonding orbitals in the ground state, and the UV absorption spectrum of methyl iodide. Experiments were carried out with a single laser, thus the same energy photons which caused the two-photon transition also ionize the molecule. A two-laser MPI technique is introduced where the exciting and ionizing photons are independent. Excited state lifetimes and ionization potentials can be measured with this simple method. Other improvements and future applications of MPI in polyatomic molecules are also discussed.
Dissert. Abstr.

N80-23108 Illinois Univ. at Urbana-Champaign.
STUDIES IN MOLECULAR COLLISION DYNAMICS: TUNNELING IN CHEMICAL REACTIONS AND VIBRATIONAL ENERGY TRANSFER IN HYDROGEN FLUORIDE SYSTEMS Ph.D. Thesis
Michael Elliott Coltrin 1979 123 p
Avail: Univ. Microfilms Order No. 8009006

Tunneling in molecular collisions and in vibrational energy transfer were studied. Both classical and semiclassical methods were used and compared with quantum mechanical results. The path corresponding to the line of inner turning points of the vibrational coordinate was proposed as the tunneling path. It is shown to be much nearer the dynamical path, i.e., it numerically satisfies Hamilton's principle of least action. The vibrational energy transfer in hydrogen fluoride-hydrogen fluoride systems is discussed. A moment method, together with quasiclassical trajectories, was used to relate the moments of the change in vibrational states to probabilities and rate constants.
Dissert. Abstr.

N80-23109 Northwestern Univ., Evanston, Ill.
VIBRATIONAL ENERGY TRANSFER IN TRIATOMIC MOLECULES: CO2 AND N2O Ph.D. Thesis
Rodney Kurt Huddleston 1979 200 p
Avail: Univ. Microfilms Order No. 8007385

Vibrational energy transfer in small molecules in the gas phase was investigated with emphasis on the triatomic molecules CO2 and N2O. General considerations relating to vibrational energy transfer processes and the laser induced infrared fluorescence technique are presented. The factors controlling the efficiency of vibrational energy transfer in triatomics are discussed with reference to theory and previous experimental studies. An information theory formalism of nonequilibrium statistical mechanics was used to derive population distributions in vibrationally excited gases where rapid vibration to vibration energy transfer occurs. The theoretical distribution is compared to published experimental results on CO. Calculated distributions for CO2 and CH3F are presented, and the results are discussed with respect to temperatures of different modes, decay of vibrational populations, and the possibility of vibrationally induced reactions.
Dissert. Abstr.

N80-23110*# California Inst. of Tech., Pasadena. Space Radiation Lab.
RESEARCH IN PARTICLES AND FIELDS Semiannual Status Report, 1 Apr. 1979 - 31 Mar. 1980
Rochus E. Vogt, A. Buffington, L. Davis, Jr., and E. C. Stone 1980 44 p refs
(Grant NGR-05-002-160)
(NASA-CR-162994) Avail: NTIS HC A03/MF A01 CSCL 20H

The astrophysical aspects of cosmic and gamma rays and the radiation environment of the Earth and other planets investigated by means of energetic particle detector systems flown on spacecraft and balloons are discussed. The theory of particles and fields in space is also addressed with particular emphasis on models of Saturn's magnetic field.
M.G.

N80-23111*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TWO-PHOTON EXCITATION CROSS-SECTION IN LIGHT AND INTERMEDIATE ATOMS
Kazem Omidvar Mar. 1980 49 p refs Revised Submitted for publication
(NASA-TM-80661) Avail: NTIS HC A03/MF A01 CSCL 20H

The method of explicit summation over the intermediate states is used along with LS coupling to derive an expression for two-photon absorption cross section in light and intermediate atoms in terms of integrals over radial wave functions. Two selection rules, one exact and one approximate, are also derived. In evaluating the radial integrals, for low-lying levels, the Hartree-Fock wave functions, and for high-lying levels, hydrogenic wave functions obtained by the quantum defect method are used. A relationship between the cross section and the oscillator strengths is derived. Cross sections due to selected transitions in nitrogen, oxygen, and chlorine are given. The expression for the cross section is useful in calculating the two-photon absorption in light and intermediate atoms.
J.M.S.

N80-23112*# California Inst. of Tech., Pasadena. W. K. Kellogg Radiation Lab.
A THERMALIZED ION EXPLOSION MODEL FOR HIGH ENERGY SPUTTERING AND TRACK REGISTRATION
L. E. Seiberling, J. E. Griffith, and T. A. Tombrello Apr. 1980 28 p refs
(Grant NGR-05-002-333; Contract EX-76-G-03-1305; Grant NSF PHY-79-23638)
(NASA-CR-162926; BAP-21) Avail: NTIS HC A03/MF A01 CSCL 20H

A velocity spectrum of neutral sputtered particles as well as a low resolution mass spectrum of sputtered molecular ions was measured for 4.74 MeV F-19(+2) incident of UF4. The velocity spectrum is dramatically different from spectra taken with low energy (keV) bombarding ions, and is shown to be consistent with a hot plasma of atoms in thermal equilibrium inside the target. A thermalized ion explosion model is proposed for high energy sputtering which is expected to describe track formation in dielectric materials. The model is shown to be consistent with the observed total sputtering yield and the dependence of the yield on the primary ionization rate of the incident ion.
E.O.K.

N80-23113# Rice Univ., Houston, Tex. Dept. of Chemistry.
REACTIONS AND ENERGY TRANSFER OF EXCITED MOLECULES Final Report, 1 May 1978 - 31 Oct. 1979
Philip R. Brooks, Scott L. Anderson, James D. Fite, and On Van Nguyen 1979 40 p refs
(Grant AF-AFOSR-3643-78; AF Proj. 2302)
(AD-A080121; AFOSR-80-0059TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

The effect of reagent rotation is investigated for the reaction K + HCl = KCl + H and found to be more important than a similar amount of translational energy. Rotation decreases reactivity. Electronic excitation of NO in the reaction NO + O3 = NO2 + O2 was shown to roughly be equivalent to ground state reactivity. Reaction is apparently enhanced by rotation of the NO molecule. The origin of these effects is not yet understood.
GRA

N80-23114# McElroy (Ralph) Co., Austin, Tex.
ON THE THEORY OF COLLISIONS BETWEEN ELECTRONS AND HYDROGEN ATOMS
G. F. Drukarev 1979 16 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 25, no. 2, 1953 p 129-138 Prepared for LASL
(Contract W-7405-eng-36)
(LA-TR-79-38) Avail: NTIS HC A02/MF A01

It is shown that the method for the calculation of exchange effects in the collision electrons with atoms which was developed previously is based on an erroneous hypothesis. The collision of an electron with a hydrogen atom is described with the aid of a wave function for a two-electron system, the function having appropriate symmetry in an implicit form. A finite system of integro-differential equations is deduced for functions which describe the state of an incident electron.
DOE

N80-23115# California Univ., Livermore. Lawrence Livermore Lab. Neutral Beam Group.
NEGATIVE ION PRODUCTION FOR NEUTRAL BEAM SYSTEMS
E. B. Hopper, Jr., comp. 15 Feb. 1979 34 p refs
(Contract W-7405-eng-48)
(SAND-18067) Avail: NTIS HC A03/MF A01

The production of negative ions for neutral beam systems

is discussed. Methods which have either been used in experiments or proposed for experiments are described and compared in terms of current, gas efficiency, and so forth. DOE

N80-23116# Florida State Univ., Tallahassee. Dept. of Physics.
ION CURRENT DENSITIES PRODUCED BY ENERGETIC ELECTRONS IN ELECTROSTATIC PRECIPITATOR GEOMETRIES
W. C. Finney, L. C. Thanh, and R. H. Davis 1979 7 p refs Presented at the 2nd Symp. on the Transfer and Utilization of Particulate Control Technol., Denver, 23-27 Jul. 1979
(Contract ET-78-S-01-3199)
(CONF-790740-2) Avail: NTIS HC A02/MF A01

A new laboratory test system for electron beam ionization in electrostatic precipitator geometries was constructed to measure ion current densities as a function of voltage differences for clean (bare) plate conditions. The new system incorporates improved electrodes, which withstand a driving voltage of + or - 55 kV, a factor of 5 increase over the previous test system. A 3 MeV Van de Graaff accelerator produced ionizing electron beams of 1.2 and 2 MeV and currents of 10.5 and 21 micro Amps in place of corona wire ionization. Current densities of up to 130 mA/sq m were measured before breakdown between the plates, and no current saturation was observed. A comparison of I-V curves and sparkover voltages for various beam energies, currents, and collimation are discussed and the need for measurements with good beam geometry is reviewed. DOE

N80-23117# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Physics.
THEORY OF HEAVY ION COLLISIONS Annual Progress Report
Daniel Sperber Aug. 1979 22 p refs
(Contract EY-76-S-02-3463)
(COO-3463-52) Avail: NTIS HC A02/MF A01

Theoretical work was focused on heavy ion collisions. A classical model was developed in order to study heavy ion reactions in different energy regimes. In the low energy regime, the analysis dealt with fusion excitation functions and strongly damped collisions. In the intermediate range, the transport coefficients were studied. In the high energy regime, pion emission in relativistic heavy ion induced reactions was studied. DOE

N80-23118# Iowa Univ., Iowa City. Dept. of Chemistry.
DISTRIBUTION OF ENERGY IN BIMOLECULAR CHEMILUMINESCENT REACTIONS INVOLVING HYDROGEN ATOMS Final Report, 1 May 1978 - 30 Apr. 1979
William C. Stwalley 1979 18 p
(Contract EY-76-S-02-2326)
(COO-2326-38) Avail: NTIS HC A02/MF A01

Spectroscopic observations of the production of visible and ultraviolet photons from the collision of 5 e H atoms with a Li/Li2 crossed beam and with 02 and H2O crossed beams are analyzed. Complementary theoretical and nonbeam spectroscopic work related to the Li2H system is considered. DOE

N80-23119# Argonne National Lab., Ill.
COLLISION INDUCED FRAGMENTATION OF FAST MOLECULAR IONS IN SOLIDS AND GASES
Donald S. Gemmell 1979 51 p refs Presented at the 8th Intern. Conf. on Atomic Collisions in Solids, Hamilton, Canada, 13-17 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790843-9) Avail: NTIS HC A04/MF A01

A brief review is given of recent high resolution measurements on fragments arising from the collision induced dissociation of fast (MeV) molecular ions. For solid targets, strong wake effects are observed. For gaseous targets, excited electronic states of the projectile ions play an important role. Measurements of this type provide useful information on the charge states of fast ions traversing matter. The experimental techniques show promise as a unique method for determining the geometrical structures of the molecular-ion projectiles. DOE

N80-23120# Stanford Linear Accelerator Center, Calif.
FURTHER MEASUREMENTS OF PARITY NONCONSERVATION IN INELASTIC ELECTRON SCATTERING
C. Y. Prescott 1979 12 p refs Presented at the 9th Intern. Symp. on Lepton and Photon Interactions at High Energy, Batavia, Ill., 23-29 Aug. 1979
(Contract EY-76-C-03-0515)
(SLAC-PUB-2401; CONF-790885-1) Avail: NTIS HC A02/MF A01

The y-dependence of the parity nonconserving asymmetries for inelastic electron scattering from deuterium was measured. The measurements cover a range of y values from 0.15 to 0.36 and show only a small y-dependence. The results are in good agreement with the Weinberg-Salam model for sq sin theta/sub W/ = 0.224 +-0.020. DOE

N80-23121# Temple Univ., Philadelphia, Pa. Dept. of Physics.
EXPERIMENTAL INVESTIGATIONS IN PARTICLE PHYSICS AT INTERMEDIATE ENERGIES Progress Report, 1 Dec. 1978 - 30 Nov. 1979
L. B. Auerbach, V. L. Highland, and W. K. McFarlane Aug. 1979 14 p
(Contract EY-76-S-02-3539)
(COO-3539-11) Avail: NTIS HC A02/MF A01

The second run to search for the three gamma and four gamma decay modes of the neutral pion is completed. (Irvine) is data-taking on the proton-antiproton bound states experiment at the Brookhaven AGS and on the proton-antiproton experiment with Rutgers and BNL was completed. The analysis of the nucleon-nucleon experiments in collaboration with UNM and LASL is nearly finished with the np elastic differential cross-section published. DOE

N80-23122# Illinois Univ. at Urbana-Champaign.
PHOTOCONDUCTIVITY STUDIES OF FERROCYANIDE ION UNDER HIGH PRESSURE Ph.D. Thesis
Martin I. Finston 1979 94 p refs
(Contract EY-76-C-02-1198)
(COO-1198-1275) Avail: NTIS HC A05/MF A01

The photoaquation of the ferrocyanide ion was studied using a high-pressure photoconductivity apparatus and a steady-state high-pressure mercury lamp. The first-order photocurrent rise-time could be related to the relative quantum efficiency of the photoaquation process, while the dark decay of the photocurrent yielded a relative value of the bimolecular rate-constant for the reverse reaction. Kinetic measurements were carried out on dilute solutions of potassium ferrocyanide in pure water, and in 20% ethanol. In both aqueous and alcoholic solution the photoaquation quantum efficiency decreased exponentially with pressure, as did the biomolecular rate-for the dark reaction in aqueous solution. The pressure dependence of the bimolecular rate-constant in the alcoholic solution indicated a diffusion-limited process. The pressure dependence of the photoaquation quantum yield, and of the bimolecular rate-constant in aqueous solution, was interpreted in terms of an activation volume model. DOE

N80-23123# California Univ., Berkeley. Dept. of physics.
OBSERVATION OF SHORT-LIVED PARTICLES PRODUCED IN HIGH ENERGY NEUTRINO INTERACTIONS
H. C. Ballagh, H. H. Bingham, W. B. Fretter, T. Lawry, G. R. Lynch, J. Lys, J. P. Marriner, J. Orthel, M. L. Stevenson, M. D. Sokoloff et al 1979 12 p refs Presented at the Neutrino 1979 Conf., Bergen, Norway, 8-12 Jun. 1979 Sponsored in part by NFS. Accelerator Lab., Univ. of Hawaii at Manoa; Univ. of Washington, Seattle; Univ. of Wisconsin, Madison
(Contract EY-76-C-03-0511)
(UH-511-345-79; CONF-790648-8) Avail: NTIS HC A02/MF A01

A sample of 89 high energy, neutrino induced dilepton events obtained in a 15 foot bubble chamber was examined which resulted in the direct observation of the production and semileptonic decay of 4 short lived particles. One charged decay, two neutral decays, and one decay of undetermined charge are found. The most likely explanation is that events represent decay of the charmed D meson. DOE

N80-23124# British Columbia Univ., Vancouver.
PION PHOTOPRODUCTION
J. M. Laget Aug. 1979 21 p refs Presented at the 8th Intern. Conf. on High-Energy Phys. and Nucl. Struct., Vancouver,

British Columbia, 13-17 Aug. 1979
(TRI-PP-79-27; CONF-790847-12) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The pion photoproduction reactions induced in the few body systems in the delta resonance energy range are examined. The multiple scattering series are summarized and relevant experiments carried out to study the corresponding singularities are described. A possible description of the N delta interaction is presented. The extensions to the threshold region, as well as to the heavier nuclei, are discussed. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N80-23125 Illinois Univ. at Urbana-Champaign.
ION-DYNAMICS IN A SPHERICAL REFLEX DIODE Ph.D. Thesis
Brian Ernest Edwards 1979 71 p
Avail: Univ. Microfilms Order No. 8009023

The electronic space charge fields created in a spherical diode are discussed for use in extracting and accelerating ions from a background plasma. Bunching of these ions was observed and space charge neutralization was accomplished by low energy electrons. The ion angular energy was found to be less than 0.1% of its radial energy, a condition allowing the excellent focusing at the center of the sphere. Dissert. Abstr.

N80-23126# Naval Research Lab., Washington, D. C.
INTENSE ION BEAM GENERATION WITH AN INVERSE REFLEX TETRODE (IRT)
J. A. Pasour, R. A. Mahaffey, J. Golden, and C. A. Kapetanakos 18 Oct. 1979 13 p refs
(NRL Proj. H02-28)
(AD-A075747; NRL-MR-4103) Avail: NTIS HC A02/MF A01 CSCL 09/1

A new reflexing electron ion source is described. The device produces a unidirectional ion beam with relatively high efficiency even when the applied magnetic field exceeds the self field. This new source operates at a low, constant impedance during much of the applied voltage pulse and is better matched to available high-power, low impedance generators than previous reflexing electron devices. GRA

N80-23127# Los Alamos Scientific Lab., N. Mex.
RF QUADRUPOLE BEAM DYNAMICS
R. H. Stokes, Kenneth R. Crandall, James E. Stovall, and Donald A. Swenson 1979 4 p ref Presented at the 1979 Particle Accelerator Conf., San Francisco, 12 Mar. 1979
(Contract W-7405-eng-36)
(LA-UR-79-657; CONF-790327-25) Avail: NTIS HC A02/MF A01

A method was developed to analyze the beam dynamics of the radiofrequency quadrupole accelerating structure. Calculations show that this structure can accept a dc beam at low velocity, bunch it with high capture efficiency, and accelerate it to a velocity suitable for injection into a drift tube linac. DOE

N80-23128# California Univ., Livermore. Lawrence Livermore Lab.
DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL SOLIDIFIED NUCLEAR WASTE
Richard A. Heckman and Thomas Holdsworth 7 May 1979 281 p refs Prepared for the US Nuclear Regulatory Comm.
(Contract W-7405-eng-48)
(UCID-18121) Avail: NTIS HC A13/MF A01

To minimize radiological risk from the operation of a waste management system, performance limits on volatilization, particulate dispersion, and dissolution characteristics of solidified high level waste must be specified. The results show clearly that the preemplacement environs are more limiting in establishing the waste form performance criteria than the post-emplacement environs. Absolute values of expected risk are very sensitive to modeling assumptions. The transportation and interim storage operations appear to be most limiting in determining the performance characteristics required. The expected values of risk do not rely upon the repositories remaining intact over the potentially hazardous lifetime of the waste. DOE

N80-23129# California Univ., Berkeley. Lawrence Berkeley Lab. Div. of Earth Sciences.
GEOHYDROLOGICAL STUDIES FOR NUCLEAR WASTE ISOLATION AT THE HANFORD RESERVATION. VOLUME 1: EXECUTIVE SUMMARY
J. Apps, T. Doe, B. Doty, R. Galbraith, A. Kearns, B. Kohrt, J. Long, A. Monroe, T. N. Narasimhan, and P. Nelson Aug. 1979 31 p refs
(Contract W-7405-eng-48)
(LBL-8764-Vol-1) Avail: NTIS HC A03/MF A01

The hydrology of the Pasco Basin near Richland, Washington was studied as part of a long-term study on the feasibility of nuclear waste disposal in the Columbia River basalt underlying the Hanford Reservation. The hydrology field program, Pasco Basin modeling, and groundwater chemistry program are summarized. Hanford well logs are also reviewed. DOE

N80-23130# State Univ. of New York, Stony Brook. Dept. of Physics.
NUCLEAR THEORY GROUP Progress Report, 1 Dec. 1979 - 30 Nov. 1980
Gerald E. Brown, Andrew D. Jackson, and Thomas T. S. Kuo 1979 94 p refs
(Contract EY-76-S-02-3001)
(COO-3001-T1) Avail: NTIS HC A05/MF A01

A broad range of topics in theoretical nuclear and intermediate-energy physics and nuclear astrophysics are covered. Primary emphasis is placed on understanding the underlying nucleon-nucleon and meson-nucleon interactions. Category headings include: fundamental interactions; intermediate-energy physics; effective interactions, nuclear models and many body theory; structure of finite nuclei; nuclear astrophysics; heavy-ion physics; and numerical analysis. DOE

N80-23131# Battelle Pacific Northwest Labs., Richland, Wash.
HIGH-LEVEL WASTE IMMOBILIZATION PROGRAM: AN OVERVIEW
W. R. Bonner Sep. 1979 46 p refs
(Contract EY-76-C-06-1830)
(PNL-3094) Avail: NTIS HC A03/MF A01

Technology to allow safe, affordable immobilization and disposal of nuclear waste is reviewed. Waste forms and processes are being developed on a schedule consistent with national needs for immobilization of high-level wastes stored at Savannah River, Hanford, Idaho National Engineering Laboratory, and West Valley, New York. This technology is directly applicable to high-level wastes from potential reprocessing of spent nuclear fuel. Topics covered include: (1) waste form development and characterization; (2) process development; and (3) radioactive process demonstration. DOE

N80-23132# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE PROJECT, SPACE NUCLEAR SAFETY PROGRAM, AND RADIOISOTOPIC TERRESTRIAL SAFETY PROGRAM Progress Report, Sep. 1979
W. J. Maraman, comp. Nov. 1979 42 p
(Contract W-7405-eng-36)
(LA-8150-PR) Avail: NTIS HC A03/MF A01

The use of Pu-238 O2 in radioisotopic power systems was studied. Three programs involved in the study: (1) general purpose heat source development; (2) space nuclear safety; and (3) radioisotopic terrestrial safety are discussed. DOE

N80-23133# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE PROJECT, SPACE NUCLEAR SAFETY PROGRAM, AND RADIOISOTOPIC TERRESTRIAL SAFETY PROGRAM Progress Report, Aug. 1979
W. J. Maraman, comp. Nov. 1979 37 p
(Contract W-7405-eng-36)

(LA-8142-PR) Avail: NTIS HC A03/MF A01

The formal monthly report covers the studies related to the use of PuO_2 in radioisotopic power systems. General purpose heat source developments, space nuclear safety, and radioisotopic terrestrial safety are among the topics discussed. DOE

N80-23134# International Engineering Co., Inc., San Francisco, Calif.

REVIEW OF GEOTECHNICAL MEASUREMENT TECHNIQUES FOR A NUCLEAR WASTE REPOSITORY IN BEDDED SALT

Dec. 1979 282 p refs

(Contract W-7405-eng-48)

(UCRL-15141) Avail: NTIS HC A13/MF A01

Geotechnical measurement techniques that can provide the data necessary for safe development of a radioactive waste repository in bedded salt are described. Geotechnical data obtained by a diversity of measurement techniques are required during all phases of respository evolution. The techniques are grouped in the following categories: geologic, geophysical and geodetic; rock mechanics; hydrologic, hydrogeologic and water quality; and thermal. Extensive tables providing a review of available measurement techniques for each category are presented. The techniques are discussed, describing the measurements and associated instruments and evaluating the applicability or limitations of the method. Detailed discussions of thermal phenomena, creep laws, and geophysical methods are contained in the appendices; references to detailed explanations of measurement techniques and instrumentation are included. DOE

N80-23135# Oak Ridge National Lab., Tenn.

RADIOACTIVE WASTE DISPOSAL AREAS AND ASSOCIATED ENVIRONMENTAL SURVEILLANCE DATA AT OAK RIDGE NATIONAL LABORATORY

T. W. Oakes and K. E. Shank Dec. 1979 34 p refs

(Contract W-7405-eng-26)

(ORNL/TM-6893) Avail: NTIS HC A03/MF A01

The solid waste burial grounds are described along with the environmental monitoring data. The various monitoring systems are reviewed, and the liquid discharge trends are discussed. Presently, a network of five environmental monitoring stations is in operation to monitor the radionuclide content of surface waters in the White Oak Creek watershed. Facts observed during the lifetime of the disposal sites include: (1) large amounts of Ru-106 were released during 1959 to 1964 due to the fact that Conasauga shale did not retain this element as well as it retained other radionuclides. (2) Large quantities of of tritiated water were released to the Clinch River in recent years, but, from a practical standpoint, little can be done to inhibit or control these releases. (3) A general downward trend in the number of curies released was observed for all other radionuclides. A number of corrective measures that have been initiated at ORNL to reduce the radioactive liquid discharges are outlined. DOE

N80-23136# Minnesota Univ., Minneapolis. School of Physics and Astronomy.

EXPERIMENTAL AND THEORETICAL HIGH ENERGY PHYSICS Progress Report, 1 Oct. 1978 - 30 Sep. 1979

1979 34 p

(Contract EY-76-C-02-1764)

(COO-1764-367) Avail: NTIS HC A03/MF A01

Theoretical and experimental high energy physics is summarized. A list of publications is included. DOE

74 OPTICS

Includes light phenomena.

N80-23137 Virginia Polytechnic Inst. and State Univ., Blacksburg.

REAL-TIME RECOGNITION OF MICROSCOPIC PHASE OBJECTS USING AN INTERFERENCE CONTRAST MICROSCOPE Ph.D. Thesis

Judy Kaye Partin 1979 120 p

Avail: Univ. Microfilms Order No. 8007339

A method of supplying real time input to a coherent optical processor is described and demonstrated. The method consists of directing a laser beam into an interference contrast microscope to produce enlarged, coherent images of the specimens. The system has the advantage of presenting high contrast, dark field images to the correlator without the need of additional preprocessing for image enhancement. In addition, the system does not require an expensive incoherent-to-coherent light transducer and is capable of utilizing both amplitude and phase information from three dimensional objects. Applications to diatom recognition are shown. Dissert. Abstr.

N80-23138 Northwestern Univ., Evanston, Ill.

OPTICAL WAVE PROPAGATION IN THE TURBULENT ATMOSPHERE Ph.D. Thesis

Samuel Chih-Hung Wang 1979 148 p

Avail: Univ. Microfilms Order No. 8007419

Optical wave propagation in random media was studied based on the theory of atmospheric turbulence and the extended Huygens-Fresnel principle. Temporal and spatial characteristics of optical waves, optical beam propagation for a finite partially coherent source in the turbulent atmosphere, pulsed plane wave propagation, and the effects of turbulence on the optical atmospheric transmittance were considered. Optical coherence, in both space and time, was studied by separating the effects which arise from the finite spatial extent of the source (spatial coherence) from those which arise from the nonmonochromaticity of radiation (temporal coherence). Pulsed wave propagation in a random medium was characterized by a two frequency mutual coherence function. The effects of turbulence on the optical atmospheric transmittance were investigated. Dissert. Abstr.

N80-23139*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Mechanical Engineering.

STUDY OF COMPOSITES AS SUBSTRATE MATERIALS IN LARGE SPACE TELESCOPES Final Report

Avva V. Sharma 1979 21 p refs

(Grant NsG-8045)

(NASA-CR-163008) Avail: NTIS HC A02/MF A01 CSCL 20F

Nonmetallic composites such as the graphite/epoxy system were investigated as possible substrates for the primary mirror of the large space telescope. The possible use of fiber reinforced metal matrix composites was reviewed in the literature. Problems arising out of the use of composites as substrate materials such as grinding, polishing, adherence of reflective coatings, rigidity of substrate, hygroscopic tendency of the composites, thermal and temporal stability and other related problems were examined. A.R.H.

N80-23140# Defence Research Establishment Valcartier (Quebec).

AN INFRARED THERMAL IMAGING SYSTEM WITH A DIGITAL SCAN CONVERTER

B. Montminy, P. Cote, and R. Carbonneau Jan. 1979 20 p refs in ENGLISH; FRENCH summary

(AD-A065465; DREV-R-4133/79) Avail: NTIS HC A02/MF A01 CSCL 17/5

This report describes a thermal imaging system consisting of an IR camera, a digital scan converter, an X-Y display monitor and a digital tape recorder. The system can be used for recording and study IR images in the 3- to 5-micrometer and 8- to 14-micrometer wavelength bands. It can also be used as an interface system for computer processing of images. GRA

N80-23141# Sperry Research Center, Sudbury, Mass.

INVESTIGATION INTO THE FEASIBILITY OF DESIGNING A FAIL SAFE OPTICAL DATA LINK Final Technical Report, 1 Jan. - 31 Dec. 1977

D. H. McMahon and W. Spillman Griffiss AFB, N.Y. RADC Dec. 1979 149 p refs

(Contract F19628-77-C-0055; AF Proj. 4600)

(AD-A080302; SCRC-CR-78-11; RADC-TR-79-284) Avail: NTIS HC A07/MF A01 CSCL 17/2

The development of a fail safe optical data link terminal and the construction of a serial fiber optic data bus system which uses several of these terminals is described. The system consists of a master terminal containing a CPU, an LED source, a photodiode detector, and several remote send/receive terminals, each containing an electro-optic modulator and a photodiode

detector. Multimode monofibers are the transmission media, and data can be impressed or tapped off at each remote terminal. After consideration of several types of terminals, an angle collimation terminal and a mirror terminal were constructed. The two terminals and a master terminal were assembled into a complete system and tested. Overall performance met or approached system objectives and the fail safe nature of the system was clearly shown. M.G.

N80-23142# Human Engineering Labs., Aberdeen Proving Ground, Md.

THE VERIFICATION OF A COMPUTER MODEL OF INTERNAL LIGHT REFLECTIONS FOR HELICOPTER CANOPY DESIGN Final Report

Christopher C. Smyth and Harry R. Stowell Oct. 1979 58 p refs

(AD-A080473; HEL-TM-21-79) Avail: NTIS HC A04/MF A01 CSCL 01/3

The U.S. Army Human Engineering Laboratory (USAHEL) has experimentally verified a computer model for internal light reflections on the transparent surfaces of helicopter canopies. The model was verified using a mockup of the Model 209 AH-1S Helicopter with the flat plate canopy design. The transmittance and coordinates of the light images on the canopy surfaces were measured at various light source positions. A matched sample was computed for the source positions using the computer model. Pearson's correlation coefficients for a linear regression analysis of the matched measured and computed values are greater than 0.98, and the results are statistically significant at the .01 level. GRA

N80-23143# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

PERFORMANCE OF OPTICAL RECEIVERS IN DETECTION OF VARIABLE DUTY CYCLE MANCHESTER CODED DATA M.S. Thesis

Robert Andrew Cilley Dec. 1979 78 p refs

(AD-A080422; AFIT/GEO/EE/79-1) Avail: NTIS HC A05/MF A01 CSCL 17/8

The goal of this paper is to determine whether the probability of error in bit detection by optical receivers can be improved through the use of a variable duty cycle Manchester modulation format and proper receiver design. It has been speculated that a short source duty cycle would improve receiver performance, particularly when the source average power is constant. The parameters assumed to affect the probability of error include optical power, temperature, pulse width, amplifier gain, signal shot noise, thermal noise, and the circuit parameters of resistance and capacitance. Performance predictions are made for the optimum receiver of signals in additive white noise, the matched-filter receiver, and two suboptimum receivers. The first suboptimum receiver is nothing more than a detector and an FET amplifier. The second consists of the same components with an equalizing filter added. Graphical data showing performance under extreme variations of the parameters listed above indicate that the matched-filter receiver is far superior to the suboptimum receivers. The equalized receiver performs better than the basic detector/amplifier receiver only under the most favorable operating conditions. The performance variation with source duty cycle varies with operating conditions. Under worst conditions the maximum duty cycle is recommended. GRA

N80-23144# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

OPTICAL RECEIVER DESIGN USING PYROELECTRIC DETECTORS M.S. Thesis

Michael James Goodman Dec. 1979 82 p refs

(AD-A080423; AFIT/GEO/EE/79-2) Avail: NTIS HC A05/MF A01 CSCL 17/5

An optical receiver operable over a broad spectral range of the infrared region is possible using a pyroelectric point detector. The pyroelectric detector is modeled as a transducer of thermal radiation to an electrical signal cascaded with an R-C network. The pyroelectric signal is amplified by a preamplifier network. The sensor is, therefore, modeled as a linear bandpass filter. The preamplifier is configured in two modes, the voltage mode which limits the response to a narrow electrical bandwidth, and the current mode which broadens the response over a wide electrical bandwidth. The responsivity bandwidth product is dependent upon the preamplifier components determined by the mode of operation. However, pulse widths and pulse repetition rates can be calculated without regard to mode of operation. The detector performance is theoretically limited by fluctuations of the incident radiation and is practically constrained by the thermally generated noise within the preamplifier components. The optical receiver signal processing consists of a whitening filter cascaded with a matched filter. The filter network is used to optimally process the sensor output. The processing scheme provides a signal-to-noise improvement of 1 million over straight detection. GRA

N80-23145# Lincoln Lab., Mass. Inst. of Tech., Lexington.

FAR INFRARED AND SUBMILLIMETER TECHNOLOGY Final Report, 1 Jan. 1977 - 31 Dec. 1979

P. E. Tannenwald Jan. 1980 49 p refs

(AD-A080710; AROD-13987.3-PX) Avail: NTIS HC A03/MF A01 CSCL 17/5

A submillimeter heterodyne receiver/radiometer has been developed that covers the spectral range from 100 micrometers to 1 mm with NEPs of 10 to the -19th power W/Hz or noise temperatures of 7000 K. It uses GaAs Schottky diodes as mixers in quasi-optical configurations. Tunable far IR radiation has been generated and used to carry out double resonance spectrocopy experiments in CH3F. Planar mixer diodes have been used to analyze the spectral properties of far IR lasers. Various applications of this newly developed near mm technology have been explored. GRA

N80-23146# Naval Ocean Systems Center, San Diego, Calif.

EMP HARDENING OF AIRBORNE SYSTEMS THROUGH ELECTRO-OPTICAL TECHNIQUES DESIGN GUIDELINES Technical Report, Apr. - Aug. 1979

R. A. Greenwell 15 Dec. 1979 55 p refs Sponsored by Defense Nuclear Agency

(AD-A080650; NOSC/TR-469) Avail: NTIS HC A04/MF A01 CSCL 18/6

This report examines the utilization of fiber optics technology as an alternative to system EMP hardening and provides design guidelines for airborne system applications. It also examines potential EMP vulnerabilities of the overall fiber optic data subsystems, defines and quantifies methods of protection against the EMP threat, and compares vulnerabilities with those of hard-wired data systems. GRA

N80-23147# Rochester Univ., N. Y.

DEVELOPMENT OF FERROMAGNETIC SPINELS FOR OPTICAL ISOLATION AT 10.6 MUONm Progress Report, 1 Dec. 1977 - 28 Feb. 1978

K. J. Teegarden Feb. 1978 7 p

(Contract EY-76-S-02-4056)

(COO-4056-6) Avail: NTIS HC A02/MF A01

The preparation of pure powders of CdCr2Se4 and the parameters necessary to hot press these into windows with low absorption at 10.6 microns are discussed. Two methods of preparation, namely growth of small single crystals from a liquid phase and a technique of coprecipitation of hydroxides and subsequent treatment with H2Se yielded samples which have an absorption coefficient of approximately 100/cm at 10.6 microns. The samples contain Cr2O3 as a major impurity. Scattering due to either pores or a second phase also limits transmission. Procedures for removing Cr2O3 and decreasing porosity are discussed. DOE

N80-23148# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereicht Halbleiter.

OPTOELECTRONIC DEVICES FOR SHORT RANGE COMMUNICATION Final Report

Werner Schairer Bonn Bundesmin. fuer Forsch. u. Technol. Aug. 1979 58 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. u. Technol.

(BMFT-FB-T-79-11) Avail: NTIS HC A04/MF A01; Fachinformationszentrum Energie, Phys., Math., Eggenstein-Leopoldshafen, West Germany DM 11,75

Glass fiber optics systems for signal transmission over short (30 m) and medium (300 m) range distances are described. Particular emphasis is placed on optical coupling efficiency and

frequency behavior. The incorporation of small plastic lenses between the fiber end and LED is shown to increase the optical coupling efficiency by up to a factor of 5. There are two complete systems described: the short range V300P system with a frequency limit of 10 MHz; and the medium range V350P system with a frequency limit of 100 MHz. Ge-doped GaAs diodes are developed with cutoff frequencies of up to 140 MHz. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-23149 Michigan Univ., Ann Arbor.
TENSOR PRESSURE TOKAMAK EQUILIBRIUM AND STABILITY Ph.D. Thesis
Anthony Cooper 1979 222 p
Avail: Univ. Microfilms Order No. 8007723

The equilibrium and MHD stability of tokamak with tensor pressure were investigated and the effects of anisotropies induced by neutral beam injections were examined. Perpendicular and parallel beam pressure components were evaluated by taking moments of a distribution function obtained from the solution of a Fokker-Planck equation that models the injection of high energy neutral beams into a tokamak. A double adiabatic energy principle was derived from a modified version of the guiding centre plasma energy principle. The asymptotic expansion (in large toroidal mode number n) and subsequent minimization of the energy principle yields an Euler equation from which a necessary stability criterion was obtained for the guiding centre plasma to oscillations of large toroidal mode number. The tensor pressure ballooning mode equation was applied computed equilibria that model experimentally determined ISX-B discharge profiles with high power neutral beam injection. Dissert. Abstr.

N80-23150 California Univ., Los Angeles.
DEVELOPMENT OF A FAR INFRARED SCATTERING SYSTEM AS A TOKAMAK DIAGNOSTIC TOOL Ph.D. Thesis
Alain Semet 1979 145 p
Avail: Univ. Microfilms Order No. 8008532

The development of a CW far infrared scattering apparatus suitable for both fusion and laboratory plasma wave scattering applications is discussed. The system consists of an optically pumped far infrared laser which is operated with CH3I or C(13) H3F, an optical scattering system based on a homodyne detection scheme, and the attendant signal processing instrumentation. Particular emphasis was placed on both the far infrared laser and its C02 laser pump. Dissert. Abstr.

N80-23151 Illinois Univ. at Urbana-Champaign.
STABILITY OF THE FIELD-REVERSED MIRROR Ph.D. Thesis
Edward Clemens Morse 1979 108 p
Avail: Univ. Microfilms Order No. 8009115

Because of finite orbit effects, the stability properties of a field-reversed mirror are different from the stability properties of similar magnetohydrodynamic equilibria. The Vlasov energy principle is applied to a computer simulation of an axisymmetric field-reversed mirror state. It was possible to prove that the lambda = 0 modes, called tearing modes, satisfy a sufficient condition for stability. Precessional modes, with lambda = 1, 2, are found to be unstable at low growth rate. This suggests possible turbulent behavior (Bohm confinement) in the experimental devices aiming at field reversal. Techniques for suppressing these instabilities are outlined, and the applicability of the Vlasov energy principle to more complicated equilibrium models is shown. Dissert. Abstr.

N80-23152 Wisconsin Univ. - Madison.
AXISYMMETRIC INSTABILITY IN A NONCIRCULAR TOKAMAK Ph.D. Thesis
Bruce Lipschultz 1979 114 p
Avail: Univ. Microfilms Order No. 8004726

The stability of dee, inverse dee, and squsre cross section plasmas to axisymmetric modes, investigated experimentally in a Tokamak with a four-null poloidal divertor is discussed. Experimental results are closely compared with predictions of two numerical stability codes: the PEST code (ideal magnetohydrodynamics, linear stability) adapted to tokapole geometry and a code which follows the nonlinear evolution of shapes similar to tokapole equilibria. The experiment and code agree that the square is the most stable shape, but experiment indicates that passive feedback is partially defeated by finite plasma resistivity. In both code and experiment square-like equilibria exhibit a relatively harmless horizontal instability. Dissert. Abstr.

N80-23153# Los Alamos Scientific Lab., N. Mex.
RECENT DEVELOPMENTS IN LINEAR THETA-PINCH AND LASER-HEATED SOLENOID RESEARCH
K. F. McKenna, R. R. Bartsch, R. J. Commisso, C. A. Ekdahl, K. B. Freese, R. F. Gribble, F. C. Jahoda, G. Miller, R. E. Siemon, J. U. Brackbill et al 1978 28 p refs Presented at the 7th Intern. Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Innsbruck, 23-30 Aug. 1978 Prepared jointly with Mathematical Sci. Northwest, Inc., Bellevue, Wash. and Wash. Univ., Seattle
(Contract W-7405-eng-36)
(LA-UR-78-1910; CONF-780811-9) Avail: NTIS HC A03/MF A01

High energy thermonuclear plasmas generated in linear theta pinches are examined. The end loss, end stoppering, stability, and heating in linear theta pinches were studied. The particle and thermal losses, the plasma flow and magnetic field interaction processes near the coil ends, the end loss suppression using solid material end plugs, and the plasma stability characteristics were investigated. The driving mechanisms of the observed m = 1 wobble instability, mathematical models of particle end loss, instability effects on radial diffusion, and magnetoacoustic heating methods are discussed. The interaction of C02 laser radiation with theta pinch like plasma columns is reported. A.W.H.

N80-23154# Oak Ridge National Lab., Tenn.
MULTICHANNEL SUBMILLIMETER INTERFEROMETER FOR TOKAMAK DENSITY MEASUREMENTS
D. P. Hutchinson, P. A. Staats, K. L. Vandersluid, and J. B. Wilgen Sep. 1979 18 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7015) Avail: NTIS HC A02/MF A01

A two channel submillimeter (SMM) laser, electron density interferometer was operated successfully on the ISX Tokamak. The interferometer is the first phase of a diagnostic system to measure the Tokamak plasma current density using the Faraday rotation of the polarization vector of SMM laser beams. The deuterated formic acid lasers produced CW power of 10 mW. The interferometer performed successfully for line averaged electron densities as high as 8 x 10 to the 13th power/cu cm. DOE

N80-23155# Naval Research Lab., Washington, D. C.
THEORY OF ELECTRON CYCLOTRON RESONANCE HEATING OF TOKAMAK PLASMAS
Edward Ott, Bertram Hui, and K. R. Chu 1979 70 p refs
(Contract EY-76-A-34-1006)
(NRL-MR-4028) Avail: NTIS HC A04/MF A01

Tokamak plasma heating by the electron cyclotron resonance was studied. The density limitations imposed by accessibility are reviewed. The predictions of linear theory (including relativistic effects on the wave absorption) are examined via solutions of the ray equations in a toroidal Tokamak equilibrium. The possibilities of scattering heating wave by existing drift wave type fluctuations and of parametric instability are examined.DOE

N80-23156# California Univ., Livermore. Lawrence Livermore Lab.
THE TANDEM MIRROR HYBRID DESIGN STUDY
R. W. Moir, B. M. Boghosian, R. S. Devoto, J. L. Erickson, J. H. Fink, J. D. Lee, J. O. Myall, W. S. Neef, Jr., G. R. Pflasterer (GE Co., Schenectady, N.Y.), A. E. Dubberley (GE Co., Schenetady, N.Y.) et al 1 Aug. 1979 496 p refs
(Contract W-7405-eng-48)
(UCID-18078) Avail: NTIS HC A21/MF A01

The initial phase of a design study of a tandem mirror fusion reactor is presented. The mechanical design of the plant, plasma

physics, blanket design, magnet design, injector design, direct convertor design, balance of plant design, fission burner reactor, and environment and safety of the reactor are examined.DOE

N80-23157# California Univ., Livermore. Lawrence Livermore Lab.
LINEAR AND NON-LINEAR CALCULATION OF RESISTIVE MAGNETOHYDRODYNAMIC INSTABILITIES
J. Killeen Sep. 1979 21 p refs Presented at the 4th IRIA Intern. Symp. on Computing Methods in Applied Sciences and Engineering, Versailles, 10-14 Dec. 1979
(Contract W-7405-eng-48)
(UCRL-83332; CONF-791201-1) Avail: NTIS HC A02/MF A01

Time dependent, linear and nonlinear, resistive magnetohydrodynamic, numerical models are reviewed. The codes compute growth rates, mode structure and saturation of tearing, rippling, and interchange modes in fusion experiments. Cartesian, cylindrical, helical, and toroidal geometries are used in the applications. The numerical methods are described and applications to reversed field configurations are presented. DOE

N80-23158# Oak Ridge National Lab., Tenn.
STABILITY OF BEAM-INDUCED TENSOR PRESSURE TOKAMAKS
W. A. Cooper (Univ. of Michigan, Ann Arbor), D. B. Nelson (DOE Washington, D.C.), G. B. Bateman, and T. Kammash (Univ. of Michigan, Ann Arbor) Oct. 1979 18 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7019) Avail: NTIS HC A02/MF A01

Necessary and sufficient criteria obtained for the high toroidal mode number stability of a guiding center plasma in low aspect ratio, D shaped, beam induced tensor pressure tokamak are presented. The difference between the two criteria for interchange stability and for ballooning stability is discussed. The critical beta value imposed by stability to ballooning modes is reported. DOE

N80-23159# Arizona Univ., Tucson. Dept. of Nuclear Engineering.
PROGRESS IN APPLICATION OF HYBRID NUMERICAL SIMULATION METHODS TO MAGNETIC CONFINEMENT SYSTEMS Annual Report
R. L. Morse Jun. 1979 27 p refs
(Contract EG-77-S-02-4259)
(COO-4259-T1) Avail: NTIS HC A03/MF A01

Hybrid codes, developed to simulate high density, high beta confined plasmas are described. The major areas of application were end plugging and heating of linear confinement systems. The role of line and recombination radiation in experiments which showed large increases in energy confinement times from the use of solid end plugs is discussed. The conception and theoretical analysis of an efficient, low frequency, axial heating method is discussed. DOE

N80-23160# Los Alamos Scientific Lab., N. Mex.
INTERFEROMETRIC EVALUATION OF DIAMOND-TURNED MIRRORS FOR CO2 LASER FUSION
J. L. Munroe 1979 8 p Presented at the Ann. Meeting of the Optical Soc. of America, Rochester, N.Y., 8 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-3196; CONF-791055-2) Avail: NTIS HC A02/MF A01

The development of the short pulse, high energy CO2 laser for application in a fusion reactor system is reported. The technique for single point diamond turning is described and its application to the fabrication of mirrors for the laser is examined. Data which can be used to improve the manufacturing process are evaluated including the average radial profile, astigmatism, and the optical power in flats. A.W.H.

N80-23161# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER SIMULATION OF SUPERTHERMAL TRANSPORT FOR LASER FUSION
David S. Kershaw 19 Oct. 1979 20 p refs Presented at the 21st Ann. Meeting of the Am. Phys. Soc., Boston, 12-16 Nov. 1979
(Contract W-7405-eng-48)
(UCRL-83494; CONF-791135-1) Avail: NTIS HC A02/MF A01

The relativistic multigroup diffusion equations describing superthermal electron transport in laser fusion plasmas are the basis for the numerical scheme presented which is used to model laser fusion experiments. DOE

N80-23162# Naval Research Lab., Washington, D. C.
ANOMALOUS TRANSPORT FROM PLASMA WAVES
W. M. Manheimer 18 Oct. 1979 34 p refs Presented at 14th Conf. Intern. sur les Phenomenes d'Ionisation dans les Gaz, Grenoble, France, 9 Jul. 1979
(Contract EX-76-A-34-1006)
(NRL-MR-4066; CONF-790708-6) Avail: NTIS HC A03/MF A01

An investigation is made as to whether one can derive, from first principles, simple scaling laws for complicated plasma devices such as a Tokamak. The approach uses phenomenological transport coefficients to describe the anomalous transport. DOE

N80-23163# Oak Ridge National Lab., Tenn.
CLASSICAL THEORY OF BEAM-INDUCED PLASMA CURRENTS
S. P. Hirshman Dec. 1979 31 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7079) Avail: NTIS HC A03/MF A01

A variational calculation of the current induced in a plasma by fast beam particles is presented. A new energy polynomial expansion of the classical Spitzer function is obtained and used to derive an accurate expression for the beam-induced current j/sub parallel which includes the effects of electron-electron collisions and is valid for all values of anti v/sub b/ - v/sub b/v sub e and effective charge anti Z. This analytic results is in excellent agreement with previous numerical calculations. An accurate rational form for the beam-induced current as a function of beam velocity is obtained by patching the large and small anti v/sub b/asymptotic expansions of j/sub parallel. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

N80-23164 Illinois Inst. of Tech., Chicago.
CONTINUUM THEORY OF GRANULAR MEDIA Ph.D. Thesis
Mostafa Rassaian 1979 123 p
Avail: Univ. Microfilms Order No. 8003659

The mechanics of granular materials are analyzed using the balance laws associated with microscopic and macroscopic continua. The notion of microscopic rotation and dilation was introduced into the continuum structure as a means for describing the local arrangement of granules at a material point. The differential equations and boundary conditions governing the microscopic behavior of granular media undergoing small deformations in equilibrium field and describing very small velocity effects in nonequilibrium field were derived by means of a systematic and consistent application of the laws of continuum physics to a defined macroscopic model. The application of the equation of the conservation of energy, the second law of thermodynamics, and the principle of material objectivity enable the determination of the constitutive equations of the nonlinear theory for both the equilibrium and the nonequilibrium fields.
Dissert. Abstr.

N80-23165 Pennsylvania State Univ., University Park.
ON THE STRUCTURE AND PROPERTIES OF POLYETHYLENE SINGLE CRYSTALS Ph.D. Thesis
James Patrick Runt 1979 237 p
Avail: Univ. Microfilms Order No. 8006051

A characterization of polyethylene (PE) single crystals in supension in a liquid is given and compared to the that of dried-down samples. The x-ray line broadening and infrared spectroscopy experiments on both dried and suspended PE crystals indicate that crystals maintained in suspension possess a greater

degree of lateral order that the corresponding dried sample. This difference in order is quantified using Differential Scanning Calorimetry. The weight fraction crystallinity of suspension samples is found to be approximately 90 percent. This is in contract to the usual values of 80 to 85 percent associated with dried PE lamellae. Melting point experiments and further analysis of heat of fusion data for suspension samples suggest that PE crystals possess folds containing 10 methylene units. Considering the evidence available at this time, it seems likely that PE single crystals posses predominately 'tight' adjacent reentry folds.
Dissert. Abstr.

N80-23166 Michigan Univ., Ann Arbor.
RADIATION DAMAGE ENHANCED HYDROGEN TRAPPING IN A SINGLE CRYSTAL MOLYBDENUM Ph.D. Thesis
Albert Leroy Hanson 1979 207 p
Avail: Univ. Microfilms Order No. 8007754

Hydrogen was implanted in samples of single crystal molybdenum, many of which were previously damaged with helium at 18 or 150 keV. The hydrogen implantations were at low energies, usually 10 keV. The enhanced retention, or trapping, of the hydrogen in the presence of this radiation damage was studied with a nuclear reaction technique. The conclusions that are drawn from the experimental results are divided into three components and discussed. Dissert. Abstr.

N80-23167 Nebraska Univ. - Lincoln.
RAMAN SCATTERING FROM MIXED-CRYSTAL LAYERED COMPOUNDS Ph.D. Thesis
George Anton Freund, Jr. 1979 204 p
Avail: Univ. Microfilms Order No. 8009585

The results of Raman scattering experiments on mixed crystals related to the transition metal dichalcogenide TiSe2 are reported. Pure TiSe2 is of interest because it undergoes a displacive structural phase transition to a superlattice. The mechanism for this phase transition is discussed. Two main aspects of the results are highlighted: (1) the mixed crystal lattice dynamics, and (2) the mechanism for the superlattice formation in TiSe2, including the effect of doping upon the transition. Dissert. Abstr.

N80-23168 Illinois Univ. at Urbana-Champaign.
CORRELATED HARTREE-FOCK BAND STRUCTURES FOR TRANSITION METALS Ph.D. Thesis
Clint Bruce Geller 1979 171 p
Avail: Univ. Microfilms Order No. 8009039

The method of local orbitals was applied to the calculation of electronic properties of transition metal systems with good metallic behavior. Hartree-Fock energy band structures employing nonlocal exchange are reported for paramagnetic and ferromagnetic nickel, palladium, and palladium hydride, and an approximate correlation correction scheme is shown to yield encouraging results. The resulting nickel band structures are found to be in excellent agreement with recent optical experiments, while available information indicates the calculated energy bands for palladium to be somewhat too narrow. Stoichiometric palladium hydride exhibits a strong dependence of the resulting electronic structure on the degree of charge transfer between palladium and hydrogen sites. Dissert. Abstr.

N80-23169 Illinois Univ. at Urbana-Champaign.
SURFACE REFLECTANCE STUDIES OF RARE GASES ADSORBED ON METAL AND OXIDE SURFACES Ph.D. Thesis
David Kimball Greenlaw 1979 257 p
Avail: Univ. Microfilms Order No. 8009047

The electronic structure of rare gas adsorbates was examined using differential reflectance spectroscopy in the vacuum ultraviolet range of photon energies. The spectral show that charge transfer processes occur when rare gas atoms adsorbed on certain metals are optically excited. The observed spectra do not permit direct determination of dielectric response of the adsorbed surface layer. A semi-quantitative correspondence between structure in the spectra and the dielectric response of the surface layer is established by fitting the data to a classical theory of the differential reflectance of surface layers. A simple and highly effective model is developed to predict whether the bonding of the excited rare gas state to the metal surface is ionic or metallic. The spectra of Xe adsorbed on Al2O3 are more complicated than that on pure metal surfaces. Features in the spectra that resemble crystal field splittings are shown to be incompatible with a simple model in which the surface crystal field has axial symmetry, perpendicular to the surface plane. Dissert. Abstr.

N80-23170 Illinois Univ. at Urbana-Champaign.
STUDIES IN THE THEORY OF SOLIDS Ph.D. Thesis
Harold Paul Hjalmarson 1979 262 p
Avail: Univ. Microfilms Order No. 8009059

The surface arrangement of atoms was studied in terms of the energetically slowly varying features of a LEED spectrum. The surface sandwich reflectivity was directly compared with the slowly varying, surface dependent features. The method was used to determine that the surface of TiS2 is ideal whereas the surface sandwich of Ti Se2 expands outward slightly. The energies of deep straps associated with impurities in semiconductors were also examined. Using band structure at symmetry points to define the impurity potential, predictions of energies of deep traps caused by impurities were made for fourteen different semiconductors. The theory is compared with the data for GaP and the alloy GaAs1-xPx before developing a phenomenological model which depends mainly on the energy centers of the valence and conduction band density of states as well as atomic energies of impurities. Dissert. Abstr.

N80-23171 Utah State Univ., Logan.
STUDIES OF ELECTRODE RESISTANCE AND HALL EFFECT IN ELECTROCHEMICAL PROCESSES Ph.D. Thesis
David Lee Rath 1979 210 p
Avail: Univ. Microfilms Order No. 8005118

The dependence of resistance and the Hall effect of thin gold film electrodes in an electrochemical cell was studied with simple charging (field effect), halide adsorption, and underpotential deposition. The in situ monitoring of the resistance and its time derivative in periodic linear sweep voltammetry along with voltammetric measurements provided a detailed and sensitive means to study the electrode-electrolyte interphase. Schemes for the statistical correlation of the derivative-resistance curves with the cyclic voltammagrams taken at several potential rates of scan were developed and found to enable precise calculations for the electrode resistance responses to adsorption and deposition processes. An integration scheme is described that uses the resistance measurements to enable a precise determination of the maximum obtainable adsorption coverage for the potential range of scans. The validity of the resistance results was checked with a comparison test where these measurements are made by the DC method and by the AC method at several frequencies. Changes in the Hall effect were investigated for simple charging and for bromide and iodide adsorption using the immersion-emersion technique. Dissert. Abstr.

N80-23172 Illinois Univ. at Urbana-Champaign.
OXIDE CHARGE TRAPS AND INTERFACE STATES AT THE SILICON - SILICON DIOXIDE INTERFACE Ph.D. Thesis
Alan Randolph Stivers 1979 157 p
Avail: Univ. Microfilms Order No. 8009184

Metal oxide semiconductor capacitors were fabricated with 2800 A thick dry grown thermal oxides under various conditions to determine the effects of oxidation parameters on oxide charge trapping. Electrons and holes were injected into the oxides by the VUV bias method. The charge trapped at the interface was measured by the capacitance voltage method and located by the photocurrent voltage method. The annealing behavior of the oxide traps are discussed. An analysis of the annealing kinetics is given. Dissert. Abstr.

N80-23173 Illinois Univ. at Urbana-Champaign.
NITROGEN ISOELECTRONIC TRAPS IN GALLIUM ARSENIDE PHOSPHIDE AND ALUMINUM GALLIUM ARSENIDE Ph.D. Thesis
Donald James Wolford, Jr. 1979 399 p
Avail: Univ. Microfilms Order No. 8009215

N trap luminescence in GaAsP and AlGaAs was examined. The photoluminescence properties of the N sub x state in GaAsP and AlGaAs are investigated at 5 K over a wide range of alloy compositions and N concentrations derived from ion implantation and annealing. Alloy diagrams for the N sub x state in these systems are presented. The N sub x emission lineshapes

interpreted at both 5 K and higher temperatures by a linear configuration coordinate coupling to both optic and acoustic phonons are discussed. Dissert. Abstr.

N80-23174 Connecticut Univ., Storrs.
DISLOCATION MOTION AND ITS EFFECT ON MAGNETIC FLUX PINNING IN TYPE-2 SUPERCONDUCTORS Ph.D. Thesis
Chan-Sui Pang 1979 91 p
Avail: Univ. Microfilms Order No. 8008690

The difference in the stress for plastic deformation between the mixed state and the superconducting state, measured in a series of lead-indium crystals is examined. These measurements showed a strong dependence of the drag stress on applied fields. The data indicate that the change in drag stress between the two states varies in the same manner as does the ultrasonic attenuation in a type 2 superconductor. Results show that dislocation motion in these alloys can be treated as an underdamped oscillator at low temperatures. Based upon the interactions between dislocation and the flux line lattice, a technique is developed which allows an in situ measurement of the mobile dislocation density in crystals. The measurements show the mobile dislocation density changes linearly with strain-rates. Futhermore, in studying the stress-strain characteristics, substantial difference in mobile dislocation density is found between various stages of the plastic deformation. Dissert. Abstr.

N80-23175 California Univ., Los Angeles.
CHARACTERIZATION OF HOMOEPITAXIAL SILICON FILMS PRODUCED BY ELECTRON BEAM DEPOSITION Ph.D. Thesis
Gracie Esther Davis 1979 143 p
Avail: Univ. Microfilms Order No. 8008469

Silicon films were deposited onto silicon (100) single crystal substrates using electron beam evaporation under moderate vacuum with low substrate heating (450 C to 650 C). A low temperature (700 - 850 C) cleaning method using anhydrous HCL etch and a low pressure heating was developed to investigate the electrical and structural properties of the evaporated films. The film's microstructure was investigated by scanning electron microscope and a transmission electron microscope in the electron diffraction mode. The electrical properties were investigated using spreading resistance, Hall measurements, Schottky and MOS C-V response and p-n junction characteristics. The boron doped source materials were found to produce films which were approximately one order of magnitude larger than the source material resistivity. The Schottky diodes were found to exhibit a C-V variation which was dependent on the deposition parameters. Dissert. Abstr.

N80-23176 Pennsylvania Univ., Philadelphia.
MAGNETOCRYSTALLINE ANISOTROPY, MAGNETOSTRICTION AND SATURATION MAGNETIZATION OF SmCo5 SINGLE CRYSTALS Ph.D. Thesis
Stanley Richard Trout 1979 93 p
Avail: Univ. Microfilms Order No. 8009472

To obtain a complete set of data on the intrinsic properties of SmCo5, the saturation magnetization, magnetocrystalline anisotropy, and magnetostriction of single crystal samples were measured from 4.2 K to room temperature and above. Magnetostriction constants were measured using strain gages at maximum fields of 110 kOe and at temperatures from 4.2 K to 300 K. The saturation magnetization was measured up to 890 K, using a vibrating sample magnetometer. Dissert. Abstr.

N80-23177 Princeton Univ., N. J.
STUDY OF THE GENERATION OF INTERFACE STATES IN THE Si-SiO2 SYSTEM AFTER HIGH-FIELD STRESS AND AFTER X-IRRADIATION Ph.D. Thesis
Genda James Hu 1979 115 p
Avail: Univ. Microfilms Order No. 8008942

Metal oxide silicon (MOS) capacitors subjected to high fields or ionizing radiation were examined. The high field stressing was done with the field plate positive in polarity, and the average fields in the oxide were 7.1 to 7.7 MV/cm. The irradiations were done with soft X-rays produced by 5 kV electrons striking a molybdenum target. A positive field plate bias providing an average field of about 1 MV/cm was used during the X-irradiation. The energy distributions within the Si bandgap of the generated interface states are discussed. The internal photoemission and photocurrent voltage techniques used to study the charge distributions in the SiO2 are described. Dissert. Abstr.

N80-23178 Michigan Univ., Ann Arbor.
HYPERFINE INTERACTION IN HYDROGEN AND NUCLEAR SPIN-SPIN COUPLING IN HYDROGEN DEUTERIDE Ph.D. Thesis
Thorsteinn Hannesson 1979 61 p
Avail: Univ. Microfilms Order No. 8007753

A model for the Fermi contact interaction is proposed, in which the charge and the magnetic moment of the nucleus are uniformly distributed within a sphere of radius R sub o. This leads to Schroedinger equation which is solvable without perturbation theory. The Schroedinger equation was solved in terms of an external solution and an internal solution. The eigenvalues were determined by a transcendental equation following from the requirement that the wave function and its derivative be continuous across r = ro. The results were used to calculate the contribution from the Fermi contact interaction to the nuclear spin - spin coupling constant of HD. Dissert. Abstr.

N80-23179 Columbia Univ., New York.
OPTOELECTRONIC AND PHOTOVOLTAIC PROPERTIES OF METAL-SiO2-SILICON TUNNELING STRUCTURES Ph.D. Thesis
Kwok Ng 1979 117 p
Avail: Univ. Microfilms Order No. 8009362

The short wave length (lambda) response of near-ideal silicon Schottky barrier photodetectors was studied. It is shown that the major cause of reduced quantum efficiency in this range of lambda is the collection by the metal of majority carriers photogenerated within the image force maximum. The potential barriers of ultrathin SiO2 layers to electrons and holes tunneling between the semiconductor and the metal were measured independently on the same MOS samples. The results show that the tunnelling barriers for holes are consisently much larger than those for electrons. Metal-SiO2-silicon (MIS) solar cells were investigated as a function of SiO2 thickness d. Both majority carrier and minority carrier structures were studied and their performance compared for SiO2 layers prepared under identical oxidation conditions and with identical silicon surface treatments. The short circuit current densities and the optimum conversion efficiencies for the majority carrier cells and for the minority carrier cells are given. Dissert. Abstr.

N80-23180*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
RADIATION DAMAGE IN HIGH VOLTAGE SILICON SOLAR CELLS
Irving Weinberg, Henry Brandhorst, Jr., Clifford K. Swartz, and Victor G. Weizer 1980 11 p refs Presented at 2nd European Symp. on Photovoltaic Generators in Space, Heidelberg, 15-17 Apr. 1980
(NASA-TM-81478; E-412) Avail: NTIS HC A02/MF A01 CSCL 20L

Three high open-circuit voltage cell designs based on 0.1 ohm-cm p-type silicon were irradiated with 1 MeV electrons and their performance determined to fluences as high as 10 to the 15th power/sq cm. Of the three cell designs, radiation induced degradation was greatest in the high-low emitter (HLE cell). The diffused and ion implanted cells degraded approximately equally but less than the HLE cell. Degradation was greatest in an HLE cell exposed to X-rays before electron irradiation. The cell regions controlling both short-circuit current and open-circuit voltage degradation were defined in all three cell types. An increase in front surface recombination velocity accompanied time dependent degradation of an HLE cell after X-irradiation. It was speculated that this was indirectly due to a decrease in positive charge at the silicon-oxide interface. Modifications aimed at reducing radiation induced degradation are proposed for all three cell types. Author

N80-23181*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF SILICATE IONS ON ELECTRODE OVERVOLTAGE

Jean-Marie Gras and Claude Seite Dec. 1979 14 p refs Transl. into ENGLISH of Effet des Ions Silicate sur les Surtensions d'Electrodes (Paris), Rept-P/539/77/24, Jun. 1977 10 p Translation was announced as N79-27413 Transl. by Sci. Transl. Serv., Santa Barbara, Calif. Original doc. prep. by Elec. de France, Paris
(Contract NASw-2791)
(NASA-TM-75760) Avail: NTIS HC A02/MF A01 CSCL 20L

The influence of the addition of a silicate to a caustic solution (KOH) is studied in order to determine the degree to which silicates inhibit the corrosion of chrysotile under conditions of electrolysis at working temperatures of 100 C and above. In an alkaline solution containing various silicate concentrations, current density was increased and electrode overvoltage was measured. Results show that silicate ion concentrations in the electrolyte increase with temperature without effecting electrochemical performance up to 115 C at 700 MA/sqcm. At this point the concentration is about 0.5 g Si/100 g KOH. Beyond this limit, electrolytic performance rapidly degenerates due to severe oxidation of the electrodes. Author

N80-23182# Fairchild Camera and Instrument Corp., Palo Alto, Calif. Research and Development Lab.
PROCESS VARIABLE DEPENDENCE AND INTERRELATIONSHIP BETWEEN AVALANCHE INJECTED AND RADIATION INDUCED CARRIER TRAPPING IN THERMAL OXIDES Quarterly Status Report, 1 Apr. - 30 Jun. 1979
Bruce E. Deal Jul. 1979 7 p
(Contract N00014-79-C-0297)
(AD-A079281; QSR-1; PR-1) Avail: NTIS HC A02/MF A01 CSCL 20/12

This is the first quarterly report on the ARPA sponsored project titled 'Process Variable Dependence and Interrelationship Between Avalanche Injected and Radiation Induced Carrier Trapping in Thermal Oxides.' This program is carried out in cooperation with the Naval Research Laboratory in Washington, DC. Progress to date includes the modification of our present computerized C-V analysis system to allow for automated avalanche carrier injection measurements and data reduction as well as the preparation of the first group of samples to be used in the program. The modifications proposed for our computerized C-V quasi-static system to convert it to an automated avalanche carrier injection trapping system have been carried out. N-type (111) silicon wafers, resistivity 0.2-0.3 ohm-cm, and p-type (111) wafers resistivity 0.4-0.7 ohm-cm were oxidized in dry O2 at 900, 1000, and 1100 C to an oxide thickness of approximately 800 A. GRA

N80-23183# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PHOTOLUMINESCENCE OF UNDOPED, SEMI-INSULATING, AND Mg-IMPLANTED INDIUM PHOSPHIDE M.S. Thesis
Gernot Siefried Pomrenke Dec. 1979 199 p refs
(AF Proj. 2306)
(AD-A080366; AFIT/GEP/PH/79D-8) Avail: NTIS HC A09/MF A01 CSCL 20/12

A photoluminescent investigation was made of undoped, semi-insulating, unannealed and annealed Mg-ion implanted, indium phosphide which originated from Czochralski, vapor, and liquid grown crystals. Ion implantation was performed at fluences of 5 x 10 to the 12th power ions/sq cm to 1 x 10 to the 15 power ions/sq cm with an energy of 120 keV at room temperature, followed by annealing at 700 degrees C and 750 degrees C for fifteen minutes using a Si3N4 encapsulant. Luminescence of undoped InP was studied with respect to temperature, emission intensity, and excitation intensity; results included the possible identification of the following radiative recombinations: free exciton, bound exciton, donor-to-valence, and donor-to-acceptor. Broad, low intensity peaks were identified at 1.0541 eV, 0.9374 eV, and 1.15 eV. Spectral results of the less intense semi-insulating InP:Fe were identical to undoped InP aside from a 1.38 eV high energy shoulder and low intensity peak at 1.31 eV. Photoluminescence of unannealed, implanted samples resulted in a 0.9643 eV peak with a long, low energy shoulder. Emission intensity and peak energy of annealed, implanted samples were studied as a function of dosage and anneal temperature. The post-implantation annealing at 750 degree C was sufficient to obtain efficient luminescence. Analysis of the 750 degree C annealed samples indicates that the peak due to recombinations involving implanted Mg acceptors is located between 1.384 eV at 50 degrees K. Superior spectral results from VPE InP places the Mg peak position at 1.3801 eV. Full width at half maximum for the 1.41 eV peak at 77.3 degrees K was 10.32 meV for Czochralski grown InP, 5.67 meV for LPE grown InP, and 4.99 meV for VPE grown InP. GRA

N80-23184# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AUTOMATED HALL EFFECT EXPERIMENT DATA ACQUISITION SYSTEM (AHEEDAS) M.S. Thesis
Edgar Alphonse Verchot Dec. 1979 208 p refs
(AD-A080175; AFIT/GEO/EE/79-D5) Avail: NTIS HC A10/MF A01 CSCL 09/2

The Air Force Materials Laboratory conducts experiments using the Hall effect to characterize the electrical properties and impurity levels of silicon samples. Both the van der Pauw and the classical Hall bar methods are used. The purpose of this study was the development of an Automated Hall Effect Experiment Data Acquisition System (AHEEDAS) to control the conduct of the experiment and to reduce all of the necessary data. The designed system is capable of controlling all aspects of the experiment except the temperature. The AHEEDAS produces as output, sample resistivity, Hall mobility, carrier concentration, and the Hall coefficient as a function of temperature. These are stored in data files on floppy disk storage along with all of the raw data from the experiment. The output is also printed on the computer terminal as the experiment is done. An LSI-11 microcomputer with 28K words of memory is used to control the experiment. Software was developed to allow this system to handle the acquisition and processing of data. The AHEEDAS was successfully implemented and tested. All functions other than the temperature control are fully operational. GRA

N80-23185# National Bureau of Standards, Washington, D.C. Surface Science Div.
THE ROLE OF STEPS AND DEFECTS IN ELECTRON STIMULATED DESORPTION: OXYGEN ON STEPPED W (110) SURFACES
Theodore E. Madey 20 Jan. 1980 51 p refs Submitted for publication
(Contract N00014-80-F-0002)
(AD-A080908; TR-10) Avail: NTIS HC A04/MF A01 CSCL 20/2

In order to examine the role of atomic steps and defects on electron stimulated desorption (ESD) phenomena, we have studied the adsorption of oxygen on a polyhedral tungsten crystal containing a W(110) flat and 4 flats having orientations 6 deg and 10 deg off the (110) plane with rows of steps parallel to the (100) and (110) directions. Upon adsorption at 300K, there is little or no ESD O(-) emission from the oxygen-covered (110) plane. In contrast, the stepped surfaces yield intense O(-) emission normal to the terraces and in 'downstep' directions, as seen using electron stimulated desorption ion angular distributions (ESDIAD). The presence of atomic steps has a major influence on sticking probability, saturation oxygen coverage and the ESDIAD patterns at all adsorption temperatures in the range 100K to greater than or approximately 1400K. Adsorption at low coordination sites appears to be a key factor in producing high ESD ion yields. GRA

N80-23186# California Inst. of Tech., Pasadena.
STEADY STATE AND RF PROPERTIES OF PROXIMITY EFFECT WEAK LINKS Final Technical Report, 1 Apr. 1978 - 31 Mar. 1979
R. P. McNamara and J. E. Mercereau 20 Dec. 1979 22 p refs Prepared in cooperation with Bell Labs., Naperville, Ill.
(Contract N00014-75-C-0913)
(AD-A081046) Avail: NTIS HC A02/MF A01 CSCL 20/3

A detailed experimental examination of the dc critical supercurrent density, j sub c, and the microwave (nonzero voltage) supercurrent, j sub mu, has been made in proximity effect thin film weak links at temperatures above the transition temperature of the link material. These results were correlated with measured

dimensional and superconducting parameters of the thin films and the link via a Ginzberg-Landau (GL) formalism. In the steady state, j sub c, was found to be adequately described by a one dimensional GL formalism similar to that of Likharev and Yakobson but with De Gennes boundary conditions on the order parameter applied at each interface. However, j sub mu decreases exponentially with increasing voltage and can be interpreted in terms of an interference modulation of the induced pair density within the link at the Josephson frequency. GRA

N80-23187# California Univ., Livermore. Lawrence Livermore Lab.
TUNABLE COHERENT UV TO NEAR IR GENERATION USING HIGH ORDER STIMULATED RAMAN SCATTERING
J. A. Paisner and R. S. Hargrove 27 Aug. 1979 20 p refs Presented at the 11th Ann. Electro Opt./Laser Conf. and Exposition, Anaheim, Calif., 23-25 Oct. 1979
(Contract W-31-109-eng-38)
(UCRL-83343; CONF-791047-1) Avail: NTIS HC A02/MF A01

A remarkably simple method to generate coherent vuv radiation is described. The technique is based on stimulated high order Raman scattering in H2 under tight focusing conditions. Using this method with tunable dye and rare gas halide pump lasers pulsed light output to 1238 A was produced. The important features of this process are discussed as well as its applications and extensions to the infrared region. DOE

N80-23188# Bell Telephone Labs., Inc., Murray Hill, N. J.
DEVELOPMENT OF MAGNETIC ORDER IN SUPERCONDUCTING SYSTEMS
D. E. Moncton, G. Shirane (Brookhaven National Lab., Upton, N.Y.), and W. Thomlinson (Brookhaven National Lab., Upton, N.Y.) Aug. 1979 23 p refs Presented at the Intern. Conf. on Neutron Scattering and Magnetism, Julich, West Germany, 29 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26655; CONF-790877-2) Avail: NTIS HC A02/MF A01

Two different classes of rare earth ternary superconductors (RERh4B4 and REMo6S8, X=S, Se) provided the first instances in which chemically ordered sublattices of magnetic ions exist in superconductors. Neutron scattering showed that simple, conventional antiferromagnetism coexists with superconductivity in a number of systems, while destruction of superconductivity occurs with the onset of ferromagnetism. The magnetic structural details are summarized for the coexistent antiferromagnets, and review measurements on the superconducting to ferromagnetic transition in ErRh4B4 are presented. DOE

N80-23189# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELECTRONS ON THE SURFACE OF LIQUID HELIUM Ph.D. Thesis
David Kay Lambert May 1979 121 p refs
(Contract W-7405-eng-48)
(LBL-9553) Avail: NTIS HC A06/MF A01

Spectroscopic techniques were used to study transitions of electrons between bound states in the potential well near a helium surface. The charge density distribution of electrons on the surface was independently obtained from electrical measurements. From these measurements information was obtained about the interaction of the bound state electrons with the surface of liquid helium and about local disorder in the positions of electrons on the surface. DOE

N80-23190# Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
CALCULATIONS OF THE LONGITUDINAL AND LATERAL DISTRIBUTIONS OF THE ENERGY DEPOSITION OF 100-500 MeV ELECTRONS IN SOME MATERIALS
R. Maas and A. Hurkmans Oct. 1979 31 p refs
(INTERIKO-79/3) Avail: NTIS HC A03/MF A01

The electromagnetic energy distribution of electron induced cascade showers was studied. Primary electron energies were between 100 and 500 MeV. The longitudinal distribution of the showers was calculated analytically and Monte Carlo methods are used to obtain the lateral distribution. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N80-23191 Illinois Univ. at Urbana-Champaign.
VARIATIONAL THEORY OF QUANTUM FLUIDS Ph.D. Thesis
Kevin Edward Schmidt 1979 163 p
Avail: Univ. Microfilms Order No. 8009163

A theory is developed to allow the systematic calculation of the properties of quantum fluids given the microscopic two body potential. Physical arguments are used to construct a correlation operator that approximately transforms the states of a noninteracting system into the corresponding states of the interacting system. The theory is regarded as a microscopic realization of Landau's assumption of a one to one correspondence between the noninteracting and interacting states. A survey of various other many body theories are discussed. The Fermi hypernetted chain integral equations are generalized to allow the calculation of E (pi) in Fermi systems, using the correlation operator wave function. The method is applied to liquid He-3 and the v sub 2 model of nuclear matter. Dissert. Abstr.

N80-23192 Pennsylvania Univ., Philadelphia.
REPRESENTATIONS OF THE ROTATIONALLY INVARIANT ALGEBRA OF QUANTUM SPIN SYSTEMS Ph.D. Thesis
Makoto Saito 1979 101 p
Avail: Univ. Microfilms Order No. 8009455

An algebra of all observables associated with quantum spin systems is investigated as the simplest nontrivial model of a nonabelian gauge invariant discrete quantum field theory. The quantum spin systems considered are restricted to systems which consist of particles of spin 1/2 situated at each lattice site. The observables at each lattice site are composed of the spin operators which are represented by Pauli spin matrices. The rotationally invariant (RINV) algebra is highlighted. The RINV algebra is obtained as the restriction to the subalgebra of the lattice algebra which is invariant under the rotation of the lattice as a whole. The structure of the RINV algebra is presented and its connection with the symmetric group is stated. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N80-23193# Admiralty Marine Technology Establishment, Teddington (England).
PERSONALIZED TASK REPRESENTATION
R. Gregory Jul. 1979 35 p refs
(AMTE(E)-TM-79103; BR69898) Avail: NTIS HC A03/MF A01

A system of task analysis, personalized task representation (PTR) is described. An example of the current PTR system is presented and its rationale and relationship to the more traditional forms of task analysis are discussed. The most important difference between PTR and these other forms of analysis is that it provides the means to take into account the reasons for, and the contexts of task activities as well as the task activities themselves. The PTR thus emphasizes the experiential as well as the behavioral components of the task. It is suggested that PTR has the potential to cope with tasks having a high non-procedural content (e.g., tactical decision making), where other forms of task analysis break down. Author (ESA)

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N80-23194* National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT. A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1980 175 p
(NASA-SP-7500(14)) Avail: NTIS HC $12.00 CSCL 05A

This bibliography cites 604 reports, articles, and other documents introduced into the NASA scientific and technical information system in 1979 covering the management of research and development, contracts, production, logistics, personnel, safety, reliability and quality control. Program, project, and systems management; management policy, philosophy, tools, and techniques; decision making processes for managers; technology assessment; management of urban problems; and information for managers on Federal resources, expenditures, financing, and budgeting are also covered. Abstracts are provided as well as subject, personal author, and corporate source indexes. A.R.H.

N80-23195 Pennsylvania Univ., Philadelphia.
AN INTERACTIVE PROCESS FOR HIERARCHICAL DECISION MAKING INCORPORATING THE MULTIPLE OBJECTIVES OF EACH PARTICIPANT Ph.D. Thesis
Robert Lee Banker 1979 215 p
Avail: Univ. Microfilms Order No. 8009383

A process which extends the concept of multiple criteria decision making to include the multiple objective used perspective of more than a single decision making entity is described. First, the identities of the decision makers are established, objectives with respect to the problem are determined, and how those objectives are related to decision variables is investigated. Next, each decision maker brings implicit preferences to bear on the problem by the use of an interactive satisficing procedure within the set of pareto-optimal alternatives. A final compromise solution to the problem is made by the top level decision makers in light of this information. An algorithm is developed to generate the set of Pareto-optimal alternatives for multiple objective linear programming problems with integer valued variables.
Dissert. Abstr.

N80-23196 George Washington Univ., Washington, D. C.
SYNTHESIS OF A THEORETICAL APPROACH FOR EMPLOYING ADAPTIVE CONFIGURATION MANAGEMENT IN AERONAUTICAL WEAPON SYSTEM PROGRAMS Ph.D. Thesis
Angelo John DiMascio 1979 426 p
Avail: Univ. Microfilms Order No. 8008364

A unified systems approach for managing aeronautical weapon system acquisition and life cycle support is discussed. The proposed holistic model provides a structured framework for integration of all of the technical and administrative elements associated with effective life cycle management. The primary integrative mechanism, which is used as the foundation module, is an expanded configuration management discipline. An adaptive configuration baseline management concept, when logically combined with basic integrated logistics management and research and development processes by a tailored system engineering methodology, is required to mitigate the acquisition and support problems attendant to technology turnover. The adaptive characteristics and the tailoring emphasis are required not only to deal with the volatile state of technology but also to accommodate the continuously decreasing influence of the military markets on the components industries. Dissert. Abstr.

N80-23197# Oak Ridge Gaseous Diffusion Plant, Tenn. Operations Analysis and Planning Div.
UTILIZATION OF PROBABILISTIC NETWORK ANALYSES IN PLANNING LONG-RANGE ENGINEERING PROJECTS
D. W. Swindle, Jr., E. H. Gift, and F. M. Bustamante 6 Sep. 1979 10 p refs Presented at the Winter Simulation Conf., San Diego, Calif., 3-5 Dec. 1979
(Contract W-7405-eng-26)
(K/OP-268; CONF-791207-1) Avail: NTIS HC A02/MF A01

The application of the GERT (Graphical Evaluation and Review Technique) probabilistic network analysis technique and the results obtained from a program analysis using GERT is discussed. A historical summary of decision analysis techniques leading to the development and application of GERT is included. Discussion is provided on the GERT methodology, study rationale, and results of an analysis examining the receiving and storage task at the Oak Ridge National Laboratory. Long-range program planning advantages using GERT are identified and discussed as relates to the methodology's decision analysis capability. DOE

N80-23198# Economic Associates, Inc., Washington, D.C.
PROBLEMS FACING SMALL COMPANIES PERFORMING RESEARCH AND DEVELOPMENT
Frank Piovia May 1979 81 p Sponsored in part by NSF
(PB80-126337) Avail: NTIS HC A05/MF A01 CSCL 05A

The results of a 1977 survey on problems faced by small companies performing research and development are presented. The problems are ranked according to importance. Characteristics of the survey participants are included. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-23199 Michigan Univ., Ann Arbor.
ABSTRACT DATA STRUCTURES AND QUERIES: TOWARD MATHEMATICAL ANALYSIS IN LOGICAL-LEVEL DATABASE DESIGN Ph.D. Thesis
Donald Eugene Swartwout 1979 271 p
Avail: Univ. Microfilms Order No. 8007845

A mathematical theory is presented which is based in large part on the premise that bodies of data are broken down into pieces for storage on electronic media and then reassembled in order to construct response to users' requests for retrieval of data. An axiomatic characterization of this reassembly operation is given and an abstract data structure (ads) is defined to be any set equipped with a binary operation which satisfies the axioms. Three aspects of adses are investigated in detail: their algebraic properties, their relationship to real-world data management, and their role in the definition and analysis of data retrieval operations. Organizations for adses are used in the study of data retrieval operations. The language of the first-order predicate calculus is used to construct definitions for queries to organized adses. Query definitions are classified into a hierarchy patterned after the arithmetical hierarchy of ordinary recursion theory.
Dissert. Abstr.

N80-23200 Duke Univ., Durham, N. C.
ON THE COMPUTATIONAL COMPLEXITY OF BRANCH AND BOUND SEARCH STRATEGIES Ph.D. Thesis
Douglas Robert Smith 1979 108 p
Avail: Univ. Microfilms Order No. 8008195

The branch and bound search method is discussed and a probabilistic model of its domain is given, namely a class of trees with an associated probability measure. The best bound first and depth-first search strategies are discussed and results on the expected time and space complexity of these strategies are presented and compared. The best bound search strategy is shown to be optimal in both time and space. These results are illustrated by data from random traveling salesman problems. Evidence is presented which suggests that the asymmetric traveling salesman problem can be solved exactly in time O(n cubed ln squared (n)) on the average. Dissert. Abstr.

N80-23201 Michigan Univ., Ann Arbor.
DESIGN OF DBMS-PROCESSABLE LOGICAL DATABASE STRUCTURES Ph.D. Thesis
Subir Purkayastha 1979 331 p
Avail: Univ. Microfilms Order No. 8007814

A computer-aided design tool for the logical data base

structure design process is developed. The inputs to the methodology are a set of data items and a set of associations or relationships between pairs of data items. Other input include the volume of data items (number of occurrences of each data item type), data item access frequencies to satisfy known processing requirements, constraints for security and storage space considerations, and relevant characteristics of a specific data base management system (DBMS). The output of the methodology is a prototype DBMS-processable logical data base structure (schema) consisting of record definitions and relationships between record types storage, and access costs for the proposed logical data base structure. The design problem is formulated as an integral programming problem and the branch and bound method is used to generate an optimum solution for the parameters specified. Dissert. Abstr.

N80-23202 Michigan Univ., Ann Arbor.
PHYSICAL DESIGN OF DATABASE STRUCTURES Ph.D. Thesis
Lewis Benjamin Oberlander 1979 336 p
Avail: Univ. Microfilms Order No. 8007795

The physical data base structure design problem is analyzed as a collection of sub-problems, each of which is separately modeled and solved by appropriate techniques. The CODASYL data model is assumed. The input to the physical design process is a logical data base structure (essentially a Bachman Diagram) and data volume and access statistics. Techniques are proposed for the record placement problem, the SET design problem, and the area design problem. Each design technique proposed requires as input results from the application of several of the other techniques, leading to circular dependencies among the techniques. An iterative scheme for integrating the techniques is proposed. The operation of this integration scheme and the individual techniques are illustrated by an example.
Dissert. Abstr.

N80-23203 Michigan Univ., Ann Arbor.
TOWARDS A THEORY FOR BEHAVIOR STUDIES OF DATA STRUCTURES Ph.D. Thesis
Siroos Afshar-Khajevand 1979 204 p
Avail: Univ. Microfilms Order No. 8007700

In order to identify those general structures which correspond to data structures, five restrictive axioms are presented, discussed, and justified. Three axioms are to be satisfied by dynamic parts, one axiom is to be satisfied by both dynamic and static parts, and one axiom is to be satisfied by the dynamic and the static parts considered as pairs. Dynamic and static parts are studied both as abstract mathematical objects and as parts of real life data structures. Several notions are defined and their real life counterparts and/or interpretations are given. Applications of the theory are presented and discussed. Examples are given as to how to employ the theory in studies concerning the power of data structures, the behavioral optimization of data structures, and the specification of abstract data structures. Dissert. Abstr.

N80-23204 Northwestern Univ., Evanston, Ill.
A SIMULATION STUDY OF ATTRIBUTE BASED LOCKING MECHANISMS FOR RELATIONAL DATABASES Ph.D. Thesis
Charles Coryell Devor 1979 149 p
Avail: Univ. Microfilms Order No. 8008158

A locking mechanism for relational databases wherein lockable resources are defined as a static two level hierarchy of database attributes and instances is proposed. In addition to this definition of resources, the concept of subset mode access is defined as an efficient vehicle for protection from phantom tuples. In this environment three separate attribute concurrency levels are definable. Each level defines more potential concurrency in exchange for more system overhead for locking. The concurrency levels are defined in terms of access to a single database attribute. To investigate the possibility of realizing such improvements in a real environment, discrete event simulation modeling is used. Studies were conducted on the performance of the three attribute concurrency levels, for different user environments.
Dissert. Abstr.

N80-23205 Illinois Univ. at Urbana-Champaign.
A METHODOLOGY FOR MACHINE REPRESENTATION OF MEDICAL KNOWLEDGE Ph.D. Thesis
Arthur Bayard Baskin, III 1979 144 p
Avail: Univ. Microfilms Order No. 8008969

A formalism for the construction of knowledge bases is presented, and some of the advantages of using a knowledge base interactively during its own construction are explored. The formalism is used to evolve a metric for knowledge which measures the quality of access to information. In addition, a system of computer programs for the interactive acquisition of medical knowledge (MEDIKAS) is described. The preliminary use of the MEDIKAS system was to represent and enforce a model of gneeral knowledge base before any medical knowledge is added. The resulting meta-knowledge provides the acquisition portions of MEDIKAS with a certain amount of self-awareness. The nature of the meta-knowledge and the results of preliminary medical knowledge input are described. Dissert. Abstr.

N80-23206 Ohio State Univ., Columbus.
A METHODOLOGY FOR THE DEFINITION OF DATA BASE WORKLOADS: AN EXTENSION TO THE IPSS METHODOLOGY Ph.D. Thesis
Patrick Man-Kwong Wong 1979 281 p
Avail: Univ. Microfilms Order No. 8008797

A methodology for characterizing the data base workload for performance accessment purpose was developed. Procedures were developed for characterizing the distribution of data base attributes within the information system's data base in an implementation independent manner, and the structure of the user generated queries which constitute the system's input workload. An algorithm transforms the general prepositional based user query into one or more normalized Boolean expressions. The second algorithm transforms the Boolean expressions into data base responses. Discrete event simulation constructs were developed based on methodological model and were incorporated into the Information Processing System Simulator's Modeling and Executional Facilities. The IPSS language extensions were implemented, tested, and verified. It was found that the methodology is applicable to both conventional information storage and retrieval systems and relational data base management systems. Dissert. Abstr.

N80-23207# Forecasting International Ltd., Arlington, Va.
INITIAL CONCEPTUALIZATION AND CHARACTERIZATION OF A NAVY AUTOMATED PUBLISHING SYSTEM. VOLUME 1: EXECUTIVE SUMMARY Final Report, 15 Feb. - 15 Nov. 1979
Norman Nisenoff and Audrey Clayton Jan. 1980 35 p refs (Contract N60921-79-C-0106)
(AD-A080375) Avail: NTIS HC A03/MF A01 CSCL 05/2

There are many inadequacies in current Navy printing and publishing capabilities, and potential for improvement is offered by rapidly advancing computer and communications technologies. This report details the findings of a research and development program conducted by Forecasting International Ltd. to provide the Navy Publications and Printing Service with an automated system concept to address these shortcomings. The Navy Automated Publishing System (NAPS) concept here described is intended to be introduced initially in the early 1980s, and evolve incrementally to meet, by the year 2000, the Navy's needs with regard to the publication of all non-tactical information. This 3 volume report presents a description of the methodology employed; a review of Navy needs in this time frame; a detailed discussion of the state-of-the-art in pertinent technologies and a forecast through the period of concern; and a broad conceptualization of both the year 2000 system and the incremental steps for its achievement. Recommendations for Navy actions to develop and test further the concept of such a system are also included. GRA

N80-23208# European Space Agency, Frascati (Italy).
THE INFORMATION RETRIEVAL SERVICE OF THE EUROPEAN SPACE AGENCY
Dec. 1979 12 p
Avail: NTIS HC A02/MF A01

The on-line retrieval system and specialized off-line services for the bibliographic data bases and factual data banks are described. Subscription information for European users is given.
Author (ESA)

N80-23209# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
EXPERIMENTS WITH MULTILINGUAL QUERIES IN A MULTILINGUAL DATA BASE
T. deHeer Jul. 1978 29 p refs
(IWIS-MEDEDEL-22) Avail: NTIS HC A03/MF A01

Information retrieval programs are described which allow for the ambiguities of natural language in searching. Information records consisting of pieces of various natural languages are attached to each other, leaving fuzzy semantic traces behind in the form of sets of three-letter-strings which were derived from the original texts. The system calculates an importance value for each possible answer to a user query. Queries are given in the form of a simple piece of language. Answers are communicated to the user, in descending order of importance value as calculated by the system. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N80-23210*# Scientific Systems, Inc., Cambridge, Mass.
WHEAT FORECAST ECONOMICS EFFECT STUDY Final Report
R. K. Mehra, R. Rouhani, S. Jones, and I. Schick Washington NASA May 1980 117 p refs
(Contract NAS5-25463)
(NASA-CR-3286) Avail: NTIS HC A06/MF A01 CSCL 05C

A model to assess the value of improved information regarding the inventories, productions, exports, and imports of crop on a worldwide basis is discussed. A previously proposed model is interpreted in a stochastic control setting and the underlying assumptions of the model are revealed. In solving the stochastic optimization problem, the Markov programming approach is much more powerful and exact as compared to the dynamic programming-simulation approach of the original model. The convergence of a dual variable Markov programming algorithm is shown to be fast and efficient. A computer program for the general model of multicountry-multiperiod is developed. As an example, the case of one country-two periods is treated and the results are presented in detail. A comparison with the original model results reveals certain interesting aspects of the algorithms and the dependence of the value of information on the incremental cost function. M.G.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-23211# Committee on Science and Technology (U. S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1980 7 p Rept. to accompany H.R. 6412 presented by the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., 22 Apr. 1980
(H-Rept-96-898; GPO-60-493) Avail: Comm. on Sci. and Technol.

The supplemental federal budget appropriations to the Space Shuttle Program for the fiscal year 1980 are explained with regard to current and projected cost data, its impact on program schedules and employment, and the effect of the legislation on inflation. A brief description of project activities is included. M.G.

N80-23212# Committee on Commerce, Science, and Transportation (U. S. Senate).
NASA SUPPLEMENTAL AUTHORIZATION FOR FISCAL YEAR, 1980
Howard W. Cannon Washington GPO 1980 10 p Rept. to accompany S. 2238 presented by the Comm. on Com., Sci., and Transportation at the 96th Congr., 2nd Sess., 12 May 1980
(S-Rept-96-694; GPO-62-346) Avail: US Capitol, Senate Document Room

The supplemental budget appropriations to sustain the space shuttle development efforts for the FY 1980 are discussed. Cost estimates, cost estimate comparisons, and a summary of program progress are given. The impacts of underfunding and program delays are briefly examined. M.G.

N80-23213# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1981
Washington GPO 1980 11 p A bill on H.R. 6413 presented to the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., 5 Feb. 1980
(H-Rept-96-899) Avail: US Capitol, House Document Room

The NASA authorization for five R and D programs are listed. Stipulations for grants to research institutions are given along with those for consultations, and construction of facilities. F.O.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.*

N80-23214*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TRACTION STUDIES OF NORTHEAST CORRIDOR RAIL PASSENGER SERVICE: EXECUTIVE SUMMARY
T. W. Macie and J. A. Stallkamp 15 Mar. 1980 64 p refs Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-162997; JPL-Pub-80-3) Avail: NTIS HC A04/MF A01 CSCL 13F

The enabling legislation of 1976 for improvement of service in the Northeast corridor (NEC) requires a schedule of 2 h 40 min between Washington and New York City by 1981 and 3 h 40 min between NYC and Boston, when the electrification is completed. Various options of the NEC operation that may satisfy the legislation were investigated, particularly in terms of travel time and energy consumption. NEC operations were compared with overseas systems and practices. The emerging new technology of AC traction was also evaluated. A.R.H.

N80-23215*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ASSESSMENT OF THE POTENTIAL OF HYBRID VEHICLES: SUMMARY
F. T. Surber et al 15 Mar. 1980 70 p refs
(Contracts NAS7-100; EM-78-I-01-4290; JPL Proj. 5030-345)
(NASA-CR-163059; JPL-Pub-80-13) Avail: NTIS HC A04/MF A01 CSCL 13F

The potential of hybrid vehicles as a replacement of the conventional gasoline or diesel fueled internal combustion engine vehicle within the next 20 to 30 years, was assessed. Hybrid vehicle designs and applications which are technically and economically viable were studied to determine if reductions in petroleum usage were large enough to warrant major expenditures of research and development funds. Critical technical areas where research and development can be most usefully concentrated were indentified. E.D.K.

N80-23216*# Honeywell, Inc., St. Paul, Minn. Technology Strategy Center.
ASSESSMENT AND PRELIMINARY DESIGN OF AN ENERGY BUFFER FOR REGENERATIVE BRAKING IN ELECTRIC VEHICLES Final Report
R. Buchholz and Anoop K. Mathur Dec. 1979 138 p

(Contracts DEN3-48; EC-77-C-31-1044)
(NASA-CR-159756; DOE/NASA/0048-79/1; TSCI0082-FR)
Avail: NTIS HC A07/MF A01 CSCL 13F

Energy buffer systems, capable of storing the vehicle energy during braking and reusing this stored energy during acceleration, were examined. Some of these buffer systems when incorporated in an electric vehicle would result in an improvement in the performance and range under stop and go driving conditions. Buffer systems considered included flywheels, hydropneumatic, pneumatic, spring, and regenerative braking. Buffer ranking and rating criteria were established. Buffer systems were rated based on predicted range improvements, consumer acceptance, driveability, safety, reliability and durability, and initial and life cycle costs. A hydropneumatic buffer system was selected.
Author

N80-23217*# MGA Research Corp., Buffalo, N.Y.
AN ANALYTICAL STUDY OF ELECTRIC VEHICLE HANDLING DYNAMICS Final Report
J. E. Greene and D. J. Segal May 1979 223 p
(Contracts NAS7-100)
(NASA-CR-162870; JPL-9950-297) Avail: NTIS HC A10/MF A01 CSCL 13F

Hypothetical electric vehicle configurations were studied by applying available analytical methods. Elementary linearized models were used in addition to a highly sophisticated vehicle dynamics computer simulation technique. Physical properties of specific EV's were defined for various battery and powertrain packaging approaches applied to a range of weight distribution and inertial properties which characterize a generic class of EV's. Computer simulations of structured maneuvers were performed for predicting handling qualities in the normal driving range and during various extreme conditions related to accident avoidance. Results indicate that an EV with forward weight bias will possess handling qualities superior to a comparable EV that is rear-heavy or equally balanced. The importance of properly matching tires, suspension systems, and brake system front/rear torque proportioning to a given EV configuration during the design stage is demonstrated.
E.D.K.

N80-23218# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va. Electrical Equipment Div.
EVA METRO SEDAN ELECTRIC PROPULSION SYSTEM TEST AND EVALUATION Technical Report, Jan. 1978 - Sep. 1979
Eberhart Reimers Sep. 1979 291 p refs
(Contract EC-77-A-31-1042)
(AD-A080655) Avail: NTIS HC A13/MF A01 CSCL 13/6

This report provides the procedure and results of the performance evaluation of an EVA Metro Sedan propulsion system. Data is provided for the automatic transmission, solid state dc motor controller and the dc motor as well as the entire propulsion system. Algorithms used on the automatic data acquisition system are included.
GRA

N80-23219# Netherlands Organization for Applied Scientific Research TNO, Delft. Planologisch Studiecentrum TNO.
TWO ESTIMATION METHODS FOR SINGLY CONSTRAINED SPATIAL DISTRIBUTION MODELS
Jan vanEst and Jan vanSettin Feb. 1978 23 p refs
(TNO-78/PS/41) Avail: NTIS HC A02/MF A01

Distribution models used the description of spatial phenomena like residential and shopping interactions are examined. A singly constrained distribution model is considered which can be used for the description of several relationships, such as home-shop interactions. Those interactions are influenced by several factors, e.g., attraction and distance variables. The influence of explanatory variables finds expression in the accessory parameters. The estimation of the values of these parameters, and the testing of their significance is called calibration. The two best known estimation procedures, i.e., the maximum likelihood and the least squares method are considered. For the singly constrained trip distribution model the linear least squares method is used directly after a special logarithmic transformation without taking into account additivity constraints and without an iterative procedure. The maximum likelihood method is also shown from a statistical point of view, to have useful properties.
Author (ESA)

N80-23220# Otis Elevator Co., Denver, Colo. Transportation Technology Div.
VEHICLE LONGITUDINAL CONTROL AND RELIABILITY PROJECT. A REVIEW OF AGT (AUTOMATED GUIDEWAY TRANSIT) CONTROL AND MEASUREMENT SYSTEM TECHNOLOGY, VOLUME 2, PART A Final Report
E. Petrino, ed. Jun. 1979 58 p refs
(Contract DOT-UT-70048)
(PB80-114036; OTIS/TTD/VLCR-066;
UMTA-IT-06-0148-79-4) Avail: NTIS HC A04/MF A01 CSCL 13B

Theoretical and implemented longitudinal control concepts as they apply to AGT vehicles are discussed. Shuttle-loop transit, large and small group rapid transit, and personal rapid transit vehicles are included. Vehicle follower point follower, and fixed block systems are reviewed along with the control of merging vehicles. The opinions available for measuring vehicle states are considered. Sensors for measuring vehicle velocity, position, and separator between vehicles are described.
GRA

N80-23221# Federal Highway Administration, Washington, D.C. Urban Planning Div.
URBAN TRANSPORTATION PLANNING SYSTEM (UTPS), THE COMMUNITY AGGREGATE PLANNING MODEL (CAPM) USER'S GUIDE. HIGHWAY SKETCH PLANNING Final Report
James M. Ryan 2 Apr. 1979 146 p refs
(PB80-131923; UMTA-UPM-20-79-2) Avail: NTIS HC A07/MF A01 CSCL 13B

The community aggregate planning model (CAPM) was recently incorporated as a module of the urban transportation planning system (UTPS) package of computer programs, and is a computerized transportation sketch planning model, which permits fast and inexpensive preliminary screening of highway improvement alternatives. It is useful in a number of sketch planning applications, such as the analysis of urban development patterns, alternative system investments, air quality, and energy consumption. The CAPM users guide and the CAPM program writeup are presented. Together, these documents provide information of the program's capabilities, limitations, data needs, potential applications, and computer requirements. Both are now available on the UTPS tape.
GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-23222 Florida Univ., Gainesville.
A DETAILED INVESTIGATION OF THE Mg2 k LINE IN BETA PERSEI Ph.D. Thesis
Ronald Anthony Parise 1979 142 p
Avail: Univ. Microfilms Order No. 8005485

Observations of beta Persei were obtained during the eclipses of December 31, 1976, January 3, 1977, and February 3, 1977, from the Copernicus spacecraft. The spectrophotometric scans which covered the bottom of the Mg2 k line at various phases in the primary eclipse are discussed. Model absorption lines are computed for Algol A and for a differentially rotating disk of material around Algol A. The Algol A profile is removed from the data and the residuals analyzed for evidence of a circumstellar disk. The observational problems inherent in the data are discussed, and suggestions are made for future research.
Dissert. Abstr.

N80-23223 Illinois Univ. at Urbana-Champaign.
THE EVOLUTION OF INTERMEDIATE MASS STARS AS A

FUNCTION OF MASS AND COMPOSITION Ph.D. Thesis
Stephen Allan Becker 1979 338 p
Avail: Univ. Microfilms Order No. 8008972

The evolution of intermediate mass stars was modeled from the main sequence phase, through the core helium burning phase, and into the thermal pulse phase or to near the point of nondegenerate carbon ignition. For a given initial mass the behavior of a model was found to be extremely sensitive to the initial composition. Each evolutionary phase was studied in order to understand how the initial composition affects a model's behavior. Dissert. Abstr.

N80-23224 Rutgers - The State Univ., New Brunswick, N. J.
A RELATIVISTIC TREATMENT OF OPTICALLY THICK STEADY STATE SPHERICAL ACCRETION ONTO BLACK HOLES Ph.D. Thesis
Arthur Wayne Gillman 1979 86 p
Avail: Univ. Microfilms Order No. 8008879

The process of steady state spherical accretion onto black holes was studied for the condition when the infalling gas is optically thick to the outgoing radiation. The transfer of radiation is treated in the diffusion approximation and the calculation is done relativistically. It is found that the accretion rate may take on arbitrarily high values while the luminosity is held below the Eddington limit. The gas in cases of high accretion rates, however, approaches zero velocity at the Schwarzschild radius so that the solution is unphysical. The luminosity is thereby limited to a low value depending on the efficiency. The conclusion is that no steady flow may exist near the Eddington limit for the case of spherical symmetry. Dissert. Abstr.

N80-23225 Arizona Univ., Tucson.
SMOOTH-ARM SPIRAL GALAXIES: THEIR PROPERTIES AND SIGNIFICANCE TO CLUSTER-GALAXY EVOLUTION Ph.D. Thesis
Mary Susan Wilkerson 1979 121 p
Avail: Univ. Microfilms Order No. 8008059

A number of galaxies with optical appearances between those of normal, actively star-forming spirals and S0 galaxies were examined. Tests made to find if these smooth arm spirals could have, at one time, been normal, actively star-forming spirals whose gas was somehow removed, and that are currently transforming into S0 galaxies are discussed and the results are evaluated. Dissert. Abstr.

N80-23226 Indiana Univ., Bloomington.
THE OLD DISK CLUSTER TRUMPLER 5 Ph.D. Thesis
J. Keith Kalinowski 1979 480 p
Avail: Univ. Microfilms Order No. 8008217

Photoelectric and photographic observations on the UBV system and photoelectric DDO system data were analyzed in a study of the star cluster Trumpler 5. This material provides information about the cluster's age, distance, luminosity function, chemical composition, morphological structure, and possible kinematics. Within a standard framework of interpretation it was found that the UBV and DDO system data are contradictory. It was hypothesized that UBV-implied and DDO-implied cluster properties can be reconciled if a low Y in Trumpler 5 produces anomalously red color indices for any given triad of stellar surface gravity, effective temperature and metallicity. Qualitative arguments based on the expected difference in the continuum opacities of the atmospheres of giant stars having different Y are made to this effect. Color corrections are proposed which permit the derivation of reasonable physical parameters for Trumpler 5's giants. Dissert. Abstr.

N80-23227*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
STUDIES IN OCCULTATION ASTRONOMY Final Report, 1 Feb. 1975 - 31 Mar. 1979
Joseph Veverka May 1980 46 p refs
(Grant NsG-7126)
(NASA-CR-163006) Avail: NTIS HC A03/MF A01 CSCL 03A

Major scientific results are summarized for the following studies: (1) observations of the 8 April 1976 occultation of epsilon Geminorum by Mars; (2) studies in occultation techniques; and (3) the March 1974 occultation of Saturn by the Moon. A re-analysis of the 1974 lunar occultation of the Titan indicates that Titan is strongly limb darkened, with D approximately greater than 5800km; there is internal evidence in the data that Titan's atmosphere is inhomogeneous; and that observations are inconsistent with any sample homogeneous model atmosphere which matches the P (lambda) and Beta (lambda) observations of Titan. A.R.H.

N80-23228*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY AND UV SPECTROSCOPY OF CYGNUS X-1 = HDE226868
S. H. Pravdo, N. E. White, Y. Kondo, R. H. Becker, E. A. Boldt, S. S. Holt, P. J. Serlemitsos, and B. G. McCluskey Feb. 1980 18 p refs Submitted for publication
(NASA-TM-80646) Avail: NTIS HC A02/MF A01 CSCL 03A

Observations are presented of Cygnus X-1 with the solid-state spectrometer on the Einstein Observatory. The X-ray spectra of two intensity dips viewed near superior conjunction did not exhibit increased photoelectric absorption. Rather the data support a model in which an increase in the electron scattering optical depth modifies both the observed spectrum and the intensity. The characteristic temperature of the intervening material is greater than 5 x 10 to the 7th power K. These measurements were in part simultaneous with observations by IUE. The ultra violet spectrum and intensity remained relatively constant during an X-ray intensity dip. Author

N80-23229*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY OBSERVATIONS OF ALGOL
N. E. White, S. S. Holt, R. H. Becker, E. A. Boldt, and P. J. Serlemitsos Mar. 1980 14 p refs Submitted for publication
(NASA-TM-80670) Avail: NTIS HC A02/MF A01 CSCL 03A

Observations of Algol using a solid state spectrometer onboard the Einstein Observatory are discussed. Two observations six months apart were made, both during a primary optical eclipse. No corresponding X-ray eclipses were seen. During the second observation the source was flaring and was on average a factor three brighter. The spectrum on both occasions was consistent with a two-component thermal equilibrium model with temperatures of approximately 7.5 and 40 million degrees. Attempts to insert a third component indicate the temperature distribution to be bimodal. Models for the X-ray emission are discussed and it is suggested that the emission most likely originates from an active corona surrounding the K star. M.G.

N80-23230# European Space Agency, Paris (France).
EXTREME ULTRAVIOLET/X-RAY SKY SURVEY MISSION: REPORT ON THE PHASE A STUDY
Dec. 1979 91 p refs
(ESA-SCI(79)9) Avail: NTIS HC A05/MF A01

The program objectives, and implementation of the mission are analyzed. The satellite and its subsystems and the telescopes are described. The survey operations include the capability to search for EUV point and nebular sources in the pass band 100 to 1000 Angstroms, and to map with high resolution the diffuse emission known to exist in the band 10 to 250 Angstroms. Author (ESA)

N80-23231# European Space Agency, Paris (France).
HIPPARCOS SPACE ASTROMETRY: REPORT ON THE PHASE A STUDY
Dec. 1979 95 p refs
(ESA-SCI(79)10) Avail: NTIS HC A05/MF A01

The HIPPARCOS mission is compared with other astrometric techniques. The payload, the spacecraft and the mission are described. Scientific data processing and the management and time schedule is presented. The mission aims at the accurate measurement of the trigonometric parallaxes, proper motions, and positions of about 100,000 selected stars. The expected average mean error is about 0.002 arc second for all angular measurements. The total scheduled time from project approval to launching is approximately 6 years. Author (ESA)

N80-23232# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.
NASA SHOULD PROVIDE THE CONGRESS COMPLETE COST INFORMATION ON THE SPACE TELESCOPE PROGRAM
3 Jan. 1980 38 p
(PB80-123433; PSAD-80-15) Avail: NTIS HC A03/MF A01 CSCL 03B

NASA's space telescope project is described and an analysis of the program reserves, contract costs, development costs, and life cycle costs is presented. The program's progress and outlook are discussed. A.W.H.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-23233 Ohio State Univ., Columbus.
CALCULATIONS OF RESONANCE FLUORESCENCE EXCITATION OF IRON 2 IN SEYFERT 1 GALAXIES Ph.D. Thesis
Craig Billig Foltz 1979 162 p
Avail: Univ. Microfilms Order No. 8009275

The source of excitation of permitted visible radiation from singly ionized iron in Seyfert 1 galaxies and related active galactic nuclei is discussed. Based upon the conditions expected in such objects, it is deduced that resonance fluorescence by continuum radiation in the wavelength region lambda lambda 2100 to 2750 A is the most probable excitation mechanism. The photoionization equilibrium equations for the conditions expected in such a cool filament were solved to determine the ionization structure of iron. The molecular equilibrium equations for the major hydrogen containing species were solved concurrently with the photoionization equilibrium with the result that virtually all of the hydrogen becomes molecular on a time scale short with respect to the crossing time of the broad line emitting region. Statistical equilibrium equations were developed for 74 energy levels of the Fe 2 ion, and radiative pumping rates were calculated for each of 406 transitions. Dissert. Abstr.

N80-23234 Columbia Univ., New York.
THERMAL CONDUCTION AND COOLING OF YOUNG NEUTRON STARS. EVOLUTION OF PULSAR MAGNETIC FIELDS Ph.D. Thesis
Alak Ray 1979 170 p
Avail: Univ. Microfilms Order No. 8009535

Thermal conductivity of matter in different regions of a neutron star is calculated. In the crust the electron conductivity is limited by electron-phonon collisions and is calculated in the Wiedermann-Franz approximation by using the standard solution of the coupled electron-phonon Boltzmann equation in the relaxation time approximation. In the core with normal nucleons, the electron and neutron conductivities are calculated in the theory of Fermi liquids. Stability and evolution of dipole and strong toroidal internal magnetic fields are considered. The problem of stability of the dipole magnetic field of a newly born pulsar is presented terms of a two dimensional model solution of the nonlinear equations of magnetohydrodynamics. A variational principle to test the linear stability of the solution is formulated.
Dissert. Abstr.

N80-23235 Columbia Univ., New York.
THE FLUID DYNAMICS OF RADIATIVELY DRIVEN ELEMENT SEPARATION IN STARS Ph.D. Thesis
John Lin 1979 183 p
Avail: Univ. Microfilms Order No. 8009354

The dynamics of the element separation process in stars is treated on a fundamental level. The dynamical system under consideration consists of 3 components: 2 level active atoms, background atoms, and the radiation field. The active gas interacts with the radiation through resonance scattering. Both the active gas and the background gas are treated as dilute gases. Kinetic equations for the active gas and for photons are obtained from one single quantum Liouville equation, using the correlation approach and a perturbative treatment. Macroscopic equations governing the coupled system of radiation and fluid are set up by employing the moment method. These equations form the basis of photohydrodynamics in studying the element separation process. The linear stability problem is studied in a Boussinesq treatment and the stabilizing effect of rotation or magnetic fields is considered. Dissert. Abstr.

N80-23236 State Univ. of New York at Stony Brook.
INTERSTELLAR DIATOMIC CARBON AND THE CYGNUS OB2 ASSOCIATION Ph.D. Thesis
Steven Peter Souza 1979 163 p
Avail: Univ. Microfilms Order No. 8009602

Diatomic carbon in interstellar clouds were investigated through reddened stars. The interstellar medium toward and stellar properties of the Cygnus OB2 association were studied through high and medium dispersion spectroscopy. The H-R diagram for Cygnus OB2 represented by mass losing evolutionary models is discussed. Dissert. Abstr.

N80-23237# Los Alamos Scientific Lab., N. Mex.
NEUTRON CROSS SECTIONS OF IMPORTANCE TO ASTROPHYSICS
John C. Browne 1979 8 p refs Presented at the Intern. Conf. on Nucl. Cross Sect. for Technol., Knoxville, Tenn., 22-26 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2900; CONF-791058-10) Avail: NTIS HC A02/MF A01

Neutron reactions of importance to the various stellar burning cycles are discussed. The role of isomeric states in the branched s-process is considered. Neutron cross section needs for the Re-187 Os-187, Rb-87 Sr-87 clocks for nuclear cosmochronology are discussed. DOE

N80-23238# European Space Agency, Paris (France).
THE FLUX GATE MAGNETIC FIELD EXPERIMENT E2 IN HELIOS A AND B: TECHNICAL DESCRIPTION
Guenter Musmann Jul. 1979 67 p refs Transl. into ENGLISH of "Das Foerstersonden-Magnetfeldexperiment E2 in Helios A und B: Technische Beschreibung", Rept. BMFT-FB-W-77-09 DFVLR, Cologne and Technische Univ., Brunswick, Dec. 1977 Original report in GERMAN previously announced as X79-72253
(ESA-TT-540; BMFT-FB-W-77-09) Avail: NTIS HC A04/MF A01; DI, Munich DM 16,40

The basic features of the three axis vector magnetometer used on HELIOS space probes for the E2 experiment are described with emphasis on the sensor and electronic system. The experiment includes not only continuously observing the interplanetary magnetic field, but also measuring its spiral structure and discontinuous appearance. The analog-digital conversion of the measured voltages, the flipper, the time average computer, the shock identification computer, and data processing techniques are discussed. A.R.H.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-23239*# Planetary Science Inst., Tucson, Ariz.
PHOBOS AND DEIMOS: ANALYSIS OF SURFACE FEATURES, EJECTA DYNAMICS AND A VOLATILE LOSS MECHANISM Final Report
Donald R. Davis, Clark R. Chapman, Richard Greenberg, and Stuart J. Weidenschilling Mar. 1980 26 p refs
(Contract NASw-3272)
(NASA-CR-163005) Avail: NTIS HC A03/MF A01 CSCL 03B

The question of whether the crater population on Phobos represents a production population or an equilibrium population

is considered. The absolute ages of cratered surfaces are interpreted and analyzed. A computer program was developed to study the dynamics of material ejected from Martian satellites and to investigate the hypothesis that at least some of the extensive set of linear features discovered on the surface of Phobos could be the result of secondary cratering from the Stickney impact. The possibility that Deimos was catastrophically disrupted by a large impact but subsequently reaccreted is considered as well as the probability the Phobos had an impact nearly large enough to disrupt it are also discussed. A.R.H.

N80-23240*# National Aeronautics and Space Administration, Washington, D. C.
VENERA-11 AND VENERA 12: PRELIMINARY ESTIMATES FOR THE WIND SPEED AND TURBULENCE IN THE ATMOSPHERE OF VENUS
V. V. Kerzhanovich, M. Ya. Makarov, F. Marov, M. K. Roshdestvenskiy, and V. P. Sorokin Aug. 1979 20 p refs Transl. into ENGLISH of "Venera-11 i Venera-12: Predvaritelnyye Otsenki Skorosti Vetra i Turbulentosti v Atmosfere Venery" Rept. Acad. of Sci. USSR, Moscow, 1979 p 1-21 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-75726) Avail: NTIS HC A02/MF A01 CSCL 03B

The methods and results of measurements for wind speed and atmospheric turbulence in the clouds of Venus are described, and compared with earlier results. The distribution of wind speed obtained from the data of Venera 12 is in good conformity with the data of the preceding Venera and Pioneer probes, indicating the existence of a constant and powerful zonal movement of the troposphere. M.G.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-23241*# California Inst. of Tech., Pasadena.
ELEMENTAL COMPOSITION OF SOLAR ENERGETIC PARTICLES IN 1977 AND 1978
W. R. Cook, E. C. Stone, R. E. Vogt, J. H. Trainor (NASA, Goddard Space Flight Center), and W. R. Webber (Univ. of New Hampshire) 1979 7 p refs Presented at 16th Intern. Cosmic Ray Conf., Kyoto, Japan, 6-18 Aug. 1979
(Contract NAS7-100; Grant NGR-05-002-169)
(NASA-CR-162927; SRL-79-8; Paper-SP-2-2) Avail: NTIS HC A02/MF A01 CSCL 03B

The elemental composition of energetic nuclei from seven major solar flare events were measured wit the cosmic ray detector systems aboard the Voyager 1 and 2 spacecraft. The energetic nuclei abundances differ significantly from those of photospheric material. They are enhanced relative to the photonisphere by a factor which is the ratio of abundance of an energetic nuclei species (relative to oxygen) over the corresponding abundance of photospheric material. This factor is common to all events and has a nonmonochromatic characteristic dependence on nuclear charge. This factor is roughly ordered by first ionization potential into two groups of elements, metallics and volatiles. A.R.H.

N80-23242# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
SOLAR INSOLATION RECORDING SYSTEM (SIRS) REFERENCE MANUAL Interim Report, Jan. 1977 - Dec. 1978
Edward E. Stapleton and Michael R. Mantz Dec. 1979 57 p refs
(AF Proj. 2054)
(AD-A080404; AFESC/ESL-TR-79-34) Avail: NTIS HC A04/MF A01 CSCL 03/2

This manual provides the installation procedures, theory of operation, and maintenance procedures necessary to install, operate, calibrate, maintain and understand the Solar Insolation Recording System (SIRS) which is a microcomputer-based data acquisition system used to collect solar insolation data. Traditionally, solar data has been collected in an analog format (strip chart). Large quantities of data were particularly difficult to manipulate. Therefore, to simplify the processing of data, a data acquisition system was designed and built which produced a computer compatible data medium. In the case of SIRS, the data media is digital cassette tapes. These tapes can be read into a larger computer where complex data manipulation/processing can be accomplished. This document strictly addresses the data acquisition system. Data reduction and manipulation will be covered in the final technical report on Solar Radiation Measuring. GRA

N80-23243# Tri-Con Associates, Inc., Cambridge, Mass.
ELECTRONICS SUBSYSTEM FOR A SOLAR EUV SPECTROMETER Final Report, 4 Nov. 1976 - 30 Sep. 1979
Robert S. Hills Hanscom AFB, Mass. AFGL Oct. 1979 14 p
(Contract F19628-77-C-0048; AF Proj. 6688)
(AD-A080560; C-160; AFGL-TR-79-0258) Avail: NTIS HC A02/MF A01 CSCL 03/2

This report describes the design, fabrication, and launch of an electronics sub-system for a grazing incidence solar spectrometer for sounding rockets. GRA

N80-23244# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NO. 421. PART 1: PROMPT REPORTS. DATA FOR JULY AND AUGUST 1979
Helen E. Coffey Sep. 1979 169 p
(PB80-128747; SGD-421-Pt-1; NOAA-79101902) Avail: NTIS HC A08/MF A01 CSCL 03B

This prompt report provides data for August 1979 on alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, coronal holes, inferred interplanetary magnetic field polarities, mean solar magnetic field, and Boulder Geomagnetic Substorm Log. It also provides data for July 1979 on daily solar activity center, sudden ionospheric disturbances, solar x-ray radiation, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices. GRA

N80-23245# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NO. 421. PART 2: COMPREHENSIVE REPORTS. DATA FOR MARCH 1979
Helen E. Coffey Sep. 1979 57 p
(PB80-128754; SGD-421-Pt-2; NOAA-79101903) Avail: NTIS HC A04/MF A01 CSCL 03B

This comprehensive report provides data for March 1979 on: active regions, synoptic solar maps, solar radio emission, energetic solar particles and plasma, and solar x-ray radiation. The miscellaneous data includes geomagnetic indices for June 1979, energetic solar particles for January 1979, and solar-terrestrial activity for 1978. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-23246*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY STUDIES WITH A GAS CHERENKOV COUNTER IN ASSOCIATION WITH AN IONIZATION SPECTROMETER
V. K. Balasubrahmanyan, J. F. Ormes, J. F. Arens, F. Siohan, G. B. Yodh, M. Simon, and H. Spiegelhauer Jan. 1980 24 p refs Submitted for publication
(NASA-TM-80639) Avail: NTIS HC A02/MF A01 CSCL 03B

The results from a balloon-borne gas Cherenkov counter (threshold 16.5 GeV/nucleon) and an ionization spectrometer are presented. The gas Cherenkov counter provides an absolute energy distribution for the response of the calorimeter for 5 < or = Z 26 nuclei of cosmic rays. The contribution of scintillation to the gas Cherenkov pulse height was obtained by independently

selecting particles below the gas Cherenkov threshold using the ionization spectrometer. Energy spectra were derived by minimizing the chi squared between Monte Carlo simulted data and flight data. Best fit power laws, dN/dE = AE-gamma, were determined for C, N, O, Ne, Mg, and Si. The power laws, all consistent with E (-2.7) are not good fits to the data. A better fit is obtained using the spectrum derived from the spectrometer. The data from the ionization calorimeter and the gas Cherenkov are thus completely self-consistent. M.G.

N80-23247*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE COSMIC X-RAY BACKGROUND
Elihu A. Boldt Mar. 1980 42 p refs Presented at the 155th Meeting, Am. Astron. Soc., San Francisco, 15 Jan. 1980
(NASA-TM-80659) Avail: NTIS HC A03/MF A01 CSCL 03B

The cosmic X-ray experiment carried out with the A2 Instrument on HEAO-1 made systematics-free measurements of the extra-galactic X-ray sky and yielded the broadband spectral characteristics for two extreme aspects of this radiation. For the apparently isotropic radiation of cosmological origin that dominates the extragalactic X-ray flux (> 3 keV), the spectrum over the energy band of maximum intensity is remarkably well described by a thermal model with a temperature of a half-billion degrees. At the other extreme, broadband observations of individual extragalactic X-ray sources with HEAO-1 are restricted to objects within the present epoch. While the non-thermal hard spectral components associated with unevolved X-ray emitting active galaxies could account for most of the gamma-ray background, the contribution of such sources to the X-ray background must be relatively small. In contrast, the 'deep-space' sources detected in soft X-rays with the HEAO-2 telescope probably represent a major portion of the extragalactic soft X-ray (< 3 keV) backgoround. A.R.H.

N80-23248*# California Inst. of Tech., Pasadena.
SATELLITE MEASUREMENTS OF THE ISOTOPIC COMPOSITION OF GALACTIC COSMIC RAYS
R. A. Mewaldt, J. D. Spalding, E. C. Stone, and R. E. Vogt 1979 7 p refs Presented at the 16th Intern. Cosmic Ray Conf., Kyoto, Japan, 6-18 Aug. 1979
(Grant NGR-05-002-160)
(NASA-CR-162923; Paper-OG-7-2; SRL-79-9) Avail: NTIS HC A02/MF A01 CSCL 03B

The individual isotopes of galactic cosmic ray Ne, Mg, and Si at 100 MeV/nucleon were clearly resolved with an rms mass resolution of 0.20 amu. The results suggest the cosmic ray source is enriched in Ne-22, Mg-25, and Mg-26 when compared to the solar system. The ratio of (Mg-25)+(Mg-26) to Mg-24, which is approximately 0.49 compared to the solar system value of 0.27, suggest that the cosmic ray source and solar system material were synthesized under different conditions. E.D.K.

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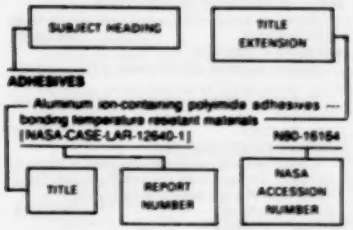

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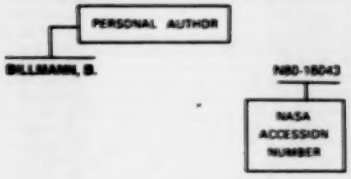

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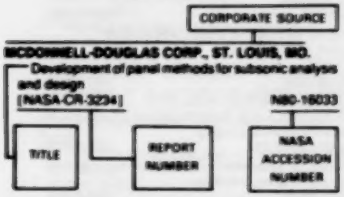

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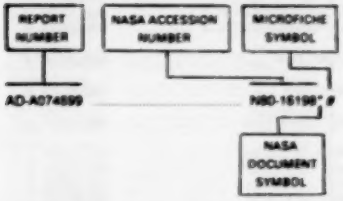

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AD-A080633 ..... N80-22387 #
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AD-A080853 ..... N80-22645 #
AD-A080908 ..... N80-23185 #
AD-A080917 ..... N80-22647 #
AD-A080953 ..... N80-22314 #
AD-A080955 ..... N80-22648 #
AD-A080964 ..... N80-22911 #
AD-A080969 ..... N80-22717 #
AD-A080987 ..... N80-22642 #
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AD-A081010 ..... N80-22501 #
AD-A081046 ..... N80-23186 #
AD-A081059 ..... N80-22302 #
AD-A081061 ..... N80-22568 #

AD-A081063 ..... N80-23022 #
AD-A081080 ..... N80-22567 #
AD-A081180 ..... N80-22544 #
AD-A081234 ..... N80-22888 #
AD-A081341 ..... N80-22365 #

AD-E000343 ..... N80-22601 #
AD-E000345 ..... N80-23031 #
AD-E000360 ..... N80-22440 #
AD-E000365 ..... N80-22744 #
AD-E300437 ..... N80-22885 #
AD-E300658 ..... N80-22910 #
AD-E430321 ..... N80-22472 #
AD-E430367 ..... N80-22269 #

AEDC-TR-79-76 ..... N80-22647 #
AEDC-TR-79-85 ..... N80-22646 #

AEM-H1-25 ..... N80-22743 #

AERO-1202 ..... N80-22314 #

AEROCHEM-TN-212 ..... N80-22796* #

AFAL-TR-79-1114 ..... N80-22586 #
AFAL-TR-79-1145 ..... N80-23012 #
AFAL-TR-79-1176 ..... N80-22559 #

AFAPL-TR-79-2087 ..... N80-22352 #
AFAPL-TR-79-2089 ..... N80-22641 #

AFESC/ESL-TR-79-34 ..... N80-23242 #

AFFDL-TR-79-3080-VOL-1 ..... N80-22988 #
AFFDL-TR-79-3080-VOL-2 ..... N80-22989 #
AFFDL-TR-79-3085 ..... N80-22267 #
AFFDL-TR-79-3116 ..... N80-22270 #
AFFDL-TR-79-3134 ..... N80-23004 #

AFGL-TR-79-0196 ..... N80-22763 #
AFGL-TR-79-0222 ..... N80-22929 #
AFGL-TR-79-0233 ..... N80-22988 #
AFGL-TR-79-0248 ..... N80-22588 #
AFGL-TR-79-0252 ..... N80-22911 #
AFGL-TR-79-0258 ..... N80-23243 #

AFHRL/HSD-103 ..... N80-22985* #
AFHRL/HSD-104 ..... N80-22984* #

AFIT/DS/AA/79S-1 ..... N80-22267 #

AFIT/DS/EE/79-1 ..... N80-22290 #

AFIT/GA/EE/79-1-VOL-1 ..... N80-22599 #
AFIT/GA/EE/79-1-VOL-2 ..... N80-22600 #

AFIT/GCS/EE/79-5 ..... N80-23021 #
AFIT/GCS/EE/79-6 ..... N80-22322 #
AFIT/GCS/EE/79-7 ..... N80-23014 #
AFIT/GCS/EE/79-11-VOL-1 ..... N80-23020 #
AFIT/GCS/EE/79-11-VOL-2 ..... N80-23019 #
AFIT/GCS/EE/79-12 ..... N80-23015 #
AFIT/GCS/EE/79-13 ..... N80-22288 #

AFIT/GCS/MA/79D-2 ..... N80-23032 #

AFIT/GE/EE/79-7 ..... N80-23013 #
AFIT/GE/EE/79-8 ..... N80-23044 #
AFIT/GE/EE/79-9 ..... N80-22361 #
AFIT/GE/EE/79-15 ..... N80-22556 #
AFIT/GE/EE/79-18 ..... N80-22551 #
AFIT/GE/EE/79-26 ..... N80-22684 #
AFIT/GE/EE/79-27 ..... N80-22362 #
AFIT/GE/EE/79-30 ..... N80-22300 #
AFIT/GE/EE/79-35 ..... N80-22552 #
AFIT/GE/EE/79-36 ..... N80-22555 #
AFIT/GE/EE/79-39 ..... N80-22554 #
AFIT/GE/EE/79-41 ..... N80-22607 #
AFIT/GE/EE/79D-11 ..... N80-22553 #
AFIT/GE/EE/79D-24 ..... N80-22684 #

AFIT/GE/MA/79D-1 ..... N80-23052 #

AFIT/GEO/EE/79-D5 ..... N80-23194 #
AFIT/GEO/EE/79-1 ..... N80-23143 #
AFIT/GEO/EE/79-2 ..... N80-23144 #
AFIT/GEO/EE/79-4 ..... N80-22602 #

AFIT/GEO/PH/79D-2 ..... N80-22680 #

AFIT/GEP/PH/79D-1 ..... N80-22681 #
AFIT/GEP/PH/79D-8 ..... N80-23183 #
AFIT/GEP/PH/79D-14 ..... N80-22638 #

AFIT/GGC/EE/79-5 ..... N80-22360 #

AFIT/GOR/MA/79D-9 ..... N80-22927 #

AFML-TR-79-4069 ..... N80-22835 #
AFML-TR-79-4148 ..... N80-22497 #
AFML-TR-79-4162 ..... N80-22717 #

AFOSR-80-0018TR ..... N80-22298 #
AFOSR-80-0029TR ..... N80-22437 #
AFOSR-80-0027TR ..... N80-22540 #
AFOSR-80-0033TR ..... N80-22489 #
AFOSR-80-0036TR ..... N80-23053 #
AFOSR-80-0049TR ..... N80-23083 #
AFOSR-80-0050TR ..... N80-23084 #
AFOSR-80-0051TR ..... N80-23050 #
AFOSR-80-0055TR ..... N80-22401 #
AFOSR-80-0059TR ..... N80-23113 #
AFOSR-80-0077TR ..... N80-22512 #
AFOSR-80-0088TR ..... N80-23034 #
AFOSR-80-0089TR ..... N80-22565 #
AFOSR-80-0106TR ..... N80-22715 #

AFWL-TR-79-71 ..... N80-22695 #

AGARD-CP-241 ..... N80-22306* #

AIRESEARCH-31-3329 ..... N80-22778* #

AMMRC-TR-79-57 ..... N80-22434 #

AMRL-TR-75-50-VOL-75 ..... N80-22991 #
AMRL-TR-75-50-VOL-120 ..... N80-22992 #
AMRL-TR-75-50-VOL-121 ..... N80-22993 #
AMRL-TR-75-50-VOL-128 ..... N80-22994 #
AMRL-TR-75-50-VOL-131 ..... N80-22995 #
AMRL-TR-75-50-VOL-132 ..... N80-22996 #
AMRL-TR-75-50-VOL-133 ..... N80-22997 #
AMRL-TR-75-50-VOL-134 ..... N80-22998 #
AMRL-TR-75-50-VOL-135 ..... N80-22999 #
AMRL-TR-75-50-VOL-139 ..... N80-23000 #
AMRL-TR-75-50-VOL-140 ..... N80-23001 #
AMRL-TR-78-107 ..... N80-22990 #

AMTE(E)-TM-79103 ..... N80-23193 #

ANL/CES/TE-79-3 ..... N80-22942 #

ANL/EES-TM-80 ..... N80-22541 #
ANL/EES-TM-81 ..... N80-22548 #

AR-001-317 ..... N80-22659 #

ARAD-394 ..... N80-22559 #

ARBRL-CR-00410 ..... N80-22269 #

ARBRL-MR-02951 ..... N80-22472 #

ARC-R/M-3838 ..... N80-22354 #

ARC-37294 ..... N80-22354 #

ARL/MECH-ENG-153 ..... N80-22659 #

ARL/PSU-TH-79-137 ..... N80-22741 #

ARL/PSU-TM-79-177 ..... N80-22498 #

ARL/STRUC-NOTE-450 ..... N80-22309 #

ARO-80-1 ..... N80-23066 #
ARO-11796.4-EL ..... N80-22550 #
ARO-13568.4-MS ..... N80-22495 #
ARO-13678.4-EL ..... N80-22550 #
ARO-13894.2-MS ..... N80-22470 #
ARO-14053.1-CX ..... N80-22441 #
ARO-14190.5-MS ..... N80-22473 #
ARO-14353.1-C ..... N80-22500 #
ARO-15880.27M ..... N80-23063 #
ARO-16358.1-C ..... N80-22498 #
ARO-16410.1-R-E ..... N80-22739 #
ARO-16713.4-M ..... N80-23090 #

AROD-13987.3-PX ..... N80-23145 #

ASRL-TR-154-13 ..... N80-22323* #
ASRL-TR-196-1 ..... N80-22357* #

AWRE-O-41/79 ..... N80-22913 #

BAP-21 ..... N80-23112* #

BBN-4006 ..... N80-22973 #

BCAC-D8-48915 ..... N80-22700* #

BHT-699-099-062-VOL-1 ..... N80-22312 #
BHT-699-099-062-VOL-2 ..... N80-22313 #

BKD67-1004 ..... N80-22635* #

BM-IC-6907 ..... N80-22768 #

BMFT-FB-M-78-04 ..... N80-22951 #

BMFT-FB-T-79-02 ..... N80-22857 #
BMFT-FB-T-79-03 ..... N80-22858 #
BMFT-FB-T-79-04 ..... N80-22859 #
BMFT-FB-T-79-05 ..... N80-22525 #
BMFT-FB-T-79-06 ..... N80-22860 #
BMFT-FB-T-79-11 ..... N80-23148 #
BMFT-FB-T-79-14 ..... N80-22621 #
BMFT-FB-T-79-16 ..... N80-22623 #
BMFT-FB-T-79-25 ..... N80-22672 #

BMFT-FB-W-77-08-REV ..... N80-22362 #
BMFT-FB-W-77-09 ..... N80-23238 #
BMFT-FB-W-77-38 ..... N80-22317 #
BMFT-FB-W-77-41 ..... N80-22450 #
BMFT-FB-W-77-47 ..... N80-22368 #
BMFT-FB-W-79-08-VOL-1 ..... N80-22275 #
BMFT-FB-W-79-07-VOL-2 ..... N80-22276 #

BNL-26833 ..... N80-22987 #
BNL-26841 ..... N80-22809 #
BNL-26855 ..... N80-23188 #
BNL-26859 ..... N80-22988 #
BNL-26707 ..... N80-23072 #
BNL-26712 ..... N80-22809 #
BNL-26736 ..... N80-22612 #

BR47382 ..... N80-22278 #
BR65539 ..... N80-22279 #
BR67660 ..... N80-22572 #
BR68395 ..... N80-22373 #
BR69062 ..... N80-22748 #
BR69542 ..... N80-23039 #
BR69631 ..... N80-22573 #
BR69809 ..... N80-23193 #
BR69932 ..... N80-22281 #
BR69944 ..... N80-22913 #
BR70171 ..... N80-22503 #
BR70172 ..... N80-22280 #
BR70262 ..... N80-22371 #
BR70263 ..... N80-22372 #
BR70264 ..... N80-22318 #
BR70270 ..... N80-22526 #
BR70502 ..... N80-22978 #
BR70894 ..... N80-22354 #

C-160 ..... N80-23243 #
C-169 ..... N80-22698 #

CALT-822-111 ..... N80-22611 #

CCS-352 ..... N80-23061 #

CONF-780807-8 ..... N80-22522 #
CONF-780811-9 ..... N80-23153 #
CONF-781025-1 ..... N80-22839 #
CONF-781228-3 ..... N80-22843 #
CONF-790327-25 ..... N80-23127 #
CONF-790363-1 ..... N80-22837 #
CONF-790485 ..... N80-22516 #
CONF-790648-8 ..... N80-23123 #
CONF-790651-7 ..... N80-22667 #
CONF-790708-6 ..... N80-23162 #
CONF-790740-2 ..... N80-23116 #
CONF-790843-9 ..... N80-23119 #
CONF-790847-12 ..... N80-23124 #
CONF-790874-1 ..... N80-23068 #
CONF-790877-2 ..... N80-23186 #
CONF-790885-1 ..... N80-23120 #
CONF-790939-1 ..... N80-23069 #
CONF-790975-2 ..... N80-22651 #

CONF-790979-1 N80-22474 #
CONF-790980-1 N80-22679 #
CONF-790989-1 N80-22620 #
CONF-791016-1 N80-22718 #
CONF-791019-1 N80-22709 #
CONF-791022-10 N80-22849 #
CONF-791023-1 N80-23045 #
CONF-791037-2 N80-22668 #
CONF-791047-1 N80-23187 #
CONF-791048-3 N80-22445 #
CONF-791048-8 N80-22878 #
CONF-791055-2 N80-23160 #
CONF-791058-10 N80-23237 #
CONF-791102-40 N80-22619 #
CONF-791102-52 N80-22618 #
CONF-791111-1 N80-23037 #
CONF-791135-1 N80-23191 #
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CONF-791207-2 N80-23072 #
CONF-791232 N80-22786* #
CONF-800104-2 N80-22271 #
CONF-7905125-1 N80-22448 #
CONF-7905125-1 N80-22746 #
CONF-7906102-2 N80-22980 #
CONF-7906106-2 N80-23084 #

COO-913-70 N80-22617 #
COO-1198-1275 N80-23122 #
COO-1764-367 N80-23126 #
COO-2326-36 N80-23118 #
COO-2597-5 N80-22951 #
COO-3001-T1 N80-23130 #
COO-3463-52 N80-23117 #
COO-3539-11 N80-23121 #
COO-4056-6 N80-23147 #
COO-4223-7 N80-22690 #
COO-4259-T1 N80-23159 #
COO-4610-T1 N80-22745 #
COO-4649-5 N80-22847 #

CORADCOM-76-0332-9 N80-22564 #

CRC-1332 N80-22546 #

CRPE-NT-56 N80-22574* #
CRPE-NT-68 N80-22622 #

CRREL-79-30 N80-22926 #

DELET-TR-78-0558-2 N80-22832 #
DELET-TR-78-0558-3 N80-22833 #
DELET-TR-78-0583-4 N80-22836 #

DFVLR-FB-78-03 N80-22403 #
DFVLR-FB-78-20 N80-22571 #
DFVLR-FB-78-21 N80-23104 #
DFVLR-FB-79-03 N80-22750 #
DFVLR-FB-79-05 N80-22654 #
DFVLR-FB-79-06 N80-22710 #
DFVLR-FB-79-07 N80-22975 #
DFVLR-FB-79-08 N80-22670 #
DFVLR-FB-79-10 N80-22915 #
DFVLR-FB-79-11 N80-22671 #
DFVLR-FB-79-12 N80-22374 #
DFVLR-FB-79-17 N80-22353 #
DFVLR-FB-79-18 N80-22319 #
DFVLR-FB-79-25 N80-22751 #
DFVLR-FB-79-30 N80-23105 #

DFVLR-MITT-79-02 N80-23005 #
DFVLR-MITT-79-06 N80-22935 #
DFVLR-MITT-79-07 N80-22577 #

DHEW/PUB/FDA-80-8092 N80-22693 #

DLR-FB-77-36 N80-23047 #
DLR-FB-77-42 N80-22404 #
DLR-FB-77-45 N80-22653 #
DLR-FB-77-47 N80-22396 #
DLR-FB-77-52 N80-22931 #
DLR-FB-77-54 N80-22449 #
DLR-FB-77-55-REV N80-22263 #
DLR-FB-77-71 N80-23023 #
DLR-FB-77-73 N80-22273 #

DLR-IB-151-77/19 N80-22272 #

DLR-IB-552-77/23 N80-22399 #
DLR-IB-552-77/26 N80-22390 #
DLR-IB-552/78-6 N80-22315 #

DNA-4925T N80-22910 #

DOE/CS-2671-3 N80-22850 #

DOE/EDP-0045 N80-22576 #

DOE/ET-10040-1(SUMM) N80-22754 #

DOE/JPL-1012-25-VOL-1 N80-22783* #
DOE/JPL-1012-25-VOL-2 N80-22784* #
DOE/JPL-1012-25-VOL-3 N80-22785* #
DOE/JPL-955491-80/2 N80-22786* #

DOE/NASA/0048-79/1 N80-23216* #
DOE/NASA/0056-79/1 N80-22787* #
DOE/NASA/0069-79/1 N80-22778* #
DOE/NASA/0612-80/1 N80-22700* #
DOE/NASA/0794-80/1 N80-22777* #
DOE/NASA/2593-79/6 N80-22776* #

DOE/TIC-4585-R1-SUPPL-3 N80-22946 #

DOT-HS-805-070 N80-23006 #

DOT-TSC-RSPA-80-4 N80-22408* #

DREA-TM-79/C N80-22639 #

DREO-TN-79-1 N80-22499 #
DREO-TN-79-15 N80-22934 #
DREO-TN-79-28 N80-23002 #

DREO-793 N80-22439 #

DRES-TN-435 N80-22438 #

DREV-R-4133/79 N80-23140 #
DREV-R-4139/79 N80-22683 #

DRIC-T-5721 N80-22503 #

DRSMI/RL-CR-80-2 N80-22395 #

DRSMI/RL-80-2 N80-22665 #

DTNSRDC-80/015 N80-22314 #

DTNSRDC/ASED-79-01 N80-22365 #

DTNSRDC/SAD/258E-1902 N80-22636 #

D180-25888-1 N80-22780* #
D180-25895-1 N80-22779* #

E-074 N80-22734* #
E-129 N80-22492* #
E-150 N80-22776* #
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